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Informal Report

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Application of Oil-Field Well Log Interpretation Techniques to the Cerro Prieto Geothermal Field

University of California

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Application of Oil-Field Well Log Interpretation Techniques to the Cerro Prieto Geothermal Field

Prepared for
Los Alamos Scientific Laboratory

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ABBREVIATIONS AND SYMBOLS

Symbol	Definition
a	Constant in F-ϕ equation
a_{mfe}	Equivalent mud filtrate activity
a_{we}	Equivalent formation water activity
CNL	Compensated Neutron Log
D_i	Diameter of invasion
DIL	Dual Induction Laterolog
F	Formation resistivity factor
FDL	Formation Density Log
F_{xo}	Formation resistivity factor from flushed zone data
IES	Induction Electric Survey
m	Cementation factor
R_{ILD}	Resistivity from Induction Log Deep, ohm-m
R_{ILM}	Resistivity from Induction Log Medium, ohm-m
R_{LL8}	Resistivity from Laterolog 8, ohm-m
R_{mf}	Resistivity of mud filtrate, ohm-m
R_{mfe}	Equivalent resistivity of mud filtrate, ohm-m
R_{mff}	Resistivity of mud filtrate at formation temperature, ohm-m
R_t	True resistivity of formation, ohm-m
R_w	Formation water resistivity, ohm-m
R_{wad}	Apparent R_w obtained from deep resistivity data, ohm-m
R_{wax}	Apparent R_w obtained from invaded zone data, ohm-m
R_{wcly}	Resistivity of fluid associated with clay, ohm-m
R_{wsp}	Apparent R_w obtained from SP Log, ohm-m
R_{xo}	Resistivity of invaded zone
SP	Self Potential
SALLY	Salinity, ppm
Saraband	Computed Log (Schlumberger Trade Mark)
S_w	Water saturation, fraction
T	Temperature, °C or °F
T_f	Formation temperature (°C or °F)
VSH	Shale content, fraction obtained from ϕ_D - ϕ_N cross plot
VSGR	Shale content, fraction (obtained from Gamma Ray)

ϕ_D	Porosity from Density Log, fraction
ϕ_{DC}	Clay porosity from Density Log
ϕ_e	Effective porosity, fraction
ϕ_N	Porosity from Neutron Log, fraction
ϕ_{NC}	Clay porosity from Neutron Log
ϕ_t	Total porosity, fraction
ρ_{DC}	Density of Dry Clay (g/cc)
ρ_{ma}	Matrix density, (g/cc)
ρ_{WC}	Density of Wet Clay (g/cc)

APPLICATION OF OIL-FIELD WELL LOG INTERPRETATION TECHNIQUES TO THE CERRO PRIETO GEOTHERMAL FIELD

by

I. Ershaghi, L. B. Phillips,
E. L. Dougherty and L. L. Handy

ABSTRACT

This study presents an example of the application of oil-field techniques to the Cerro Prieto Field, Mexico. The lithology in this field (sand-shale lithology) is relatively similar to oil-field systems. The study was undertaken as a part of the first series of case studies supported by the Geothermal Log Interpretation Program (GLIP) of the U. S. Department of Energy managed by the Los Alamos Scientific Laboratory.

The suites of logs for individual wells were far from complete. This was partly because of adverse borehole conditions but mostly because of unavailability of high-temperature tools. The most complete set of logs was a combination of Dual Induction Laterolog, Compensated Formation Density Gamma Ray, Compensated Neutron Log, and Saraband. Temperature data about the wells were sketchy, and the logs had been run under pre-cooled mud condition.

A system of interpretation consisting of a combination of graphic and numerical studies was used to study the logs. From graphical studies, evidence of hydrothermal alteration may be established from the trend analysis of SP (self potential) and ILD (deep induction log). Furthermore, the cross plot techniques using data from density and neutron logs may help in establishing compaction as well as rock density profile with depth.

In the numerical method, R_{wa} values from three different resistivity logs were computed and brought into agreement. From this approach we were able to establish values of formation temperature and mud filtrate resistivity effective at the time of logging.

I. INTRODUCTION

The estimation of reserve and calculation of recovery for a subterranean resource requires tools and techniques that either directly or indirectly measure properties of the resource. In the field of oil and gas technology, reservoir engineers rely heavily on borehole geophysical surveys. The first objective of such surveys is detecting the presence of hydrocarbon. Upon the discovery of hydrocarbon, attention is then focused on the lithological and structural characteristics of the reservoir rock.

Since well logs do not measure any of the important rock and fluid properties directly, accurate interpretation of log derived values requires a good understanding of borehole conditions, lithology, and the physical limitations of the tools and their proper calibration.

Significant progress in all areas of well logging has been made during the last two decades. Improvements in tool design and calibration as well as advancement in the art of well log interpretation has made the well logs a basic ingredient in most field exploration and development programs.

Petrophysical studies using electrical or radioactive well logs for oil and gas reservoirs have contributed significantly to an understanding of the configurations and geologic characteristics of such reservoirs. Some aspects of log interpretation for oil and gas reservoirs, however, are still undeveloped and additional research work is seriously needed. Examples include detection of fracture permeability, permeability profile, and high temperature environment effects on empirical correlations.

In recent years other subterranean energy resources such as geothermal, coal, and uranium have come into focus. A review of literature shows a surge in the application of existing techniques to nonpetroleum resources. As a result, the interest in advancement of the science and the art of subsurface formation evaluation is expanding in all directions.

Because of the differences in the type of energy resources and their environments, requirements on both the logging tools and the interpretation techniques may vary. Just as tools or techniques developed for oil and gas exploration may have application to other areas, advancements in the development of new methods for recording or analyzing data in nonpetroleum resources may contribute to the better evaluation of oil and gas formations under severe borehole conditions or for nonconventional lithologies.

The purpose of this study was to apply the current state of the art of well log interpretation to logs available from a liquid-dominated geothermal system. Because of temperature limitations on tools and complex lithologies, in only very few cases have well logs been run in geothermal systems. For metamorphic and igneous rocks some of the conventional logs such as Induction Electric Survey (IES) lose their diagnostic capabilities. Since most of the oilfield type interpretation techniques include the use of SP and resistivity data, for the purpose of this research we focused on a geothermal reservoir with lithologies similar to oilfield systems.

The Cerro Prieto Field located in Mexico was selected for this purpose. The lithology is mostly a sand-shale series. The available logs are conventional surveys such as Induction-Electric Log, Dual-Induction Laterolog, Compensated Density Log, and Compensated Neutron Log. This field has become an international scientific laboratory for researchers and scientists studying different aspects of the geothermal resource.

Through a cooperative program between the Comision Federal de Electricidad de Mexico and the Lawrence Berkeley Laboratory (LBL) copies of certain well logs were made available. Unfortunately, there was not a complete suite of logs for most wells. We therefore implemented our study with a limited number of logs. This included a Compensated Formation Density, Gamma Ray, Dual-Induction Laterolog with Self-Potential, and Compensated Neutron Log.

Our first objective was to analyze the logs with total disregard for the lithological characteristics and the extreme temperature ranges of the formation. Second, we were to identify the limitation of the existing data base and point out the desired additional data needed for a complete evaluation job. Third, work was focused on analyzing the data to arrive at a feasible interpretation and to compare the results with reservoir data available from other published studies.

II. GEOLOGY OF THE CERRO PRIETO FIELD

The Cerro Prieto Geothermal Field is located in the Mexicali-Salton Sea basin about 35 km south of Mexicali in Baja California, Fig. I. The field is named after the nearby Cerro Prieto (Black Hill) volcano.

As described by Noble, et al.,[1] the reservoir at Cerro Prieto consists of an interbedded sequence of deltaic sands and shales of variable thicknesses.

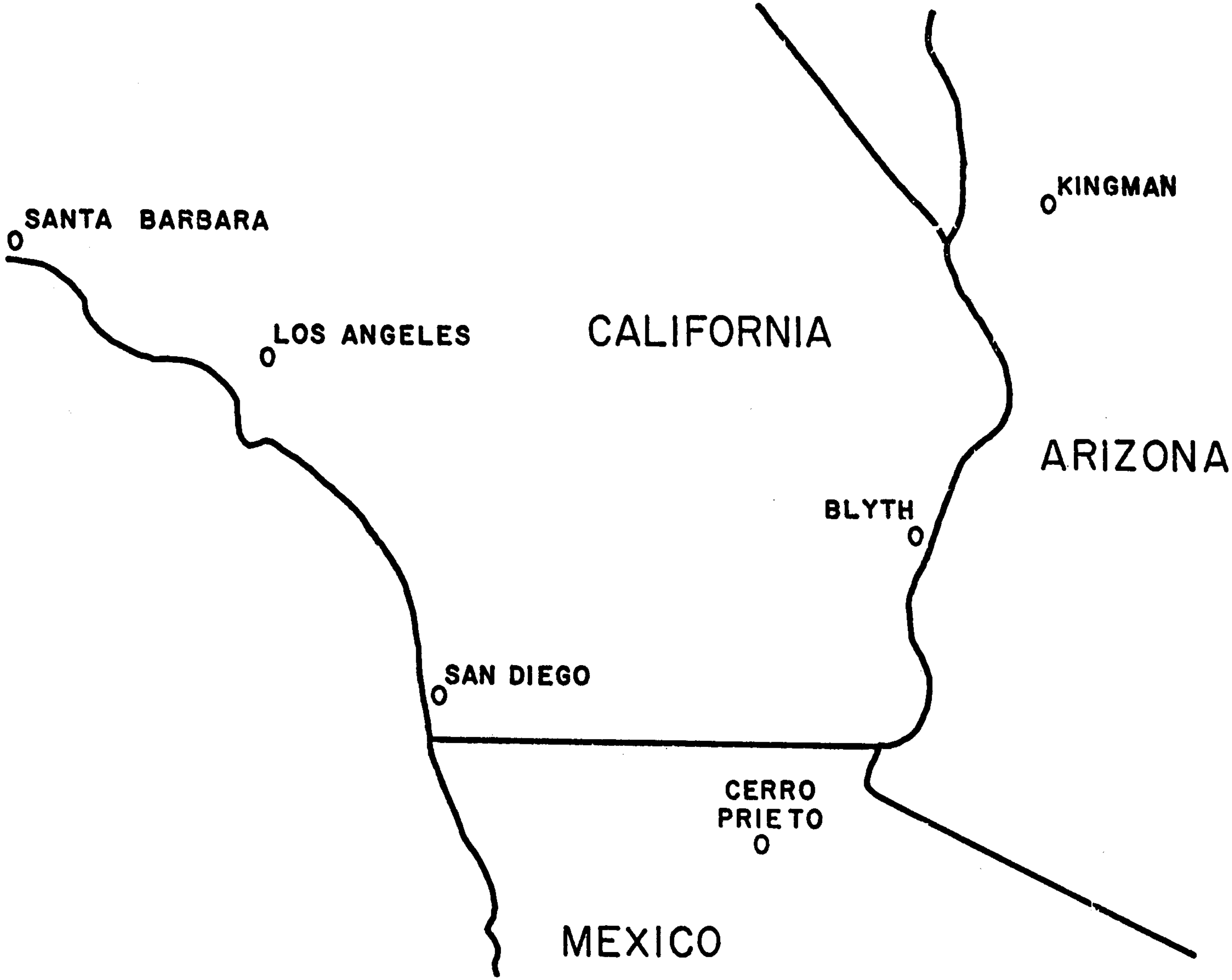

Fig. 1. Geographical location of the Cerro Prieto Field.

Cruz[2] indicated that the deltaic sediments may be divided into two units: unconsolidated Quaternary sediments composed of clays, sands and gravels, and consolidated tertiary deltaic sediments composed of siltstone, shales and sandstones.

Elders[3] and his co-workers have done extensive work using x-ray diffraction on cuttings and cores to identify the mineralogic composition of reservoir rock in Cerro Prieto. Based on their results,[4-6] indications are that the most abundant minerals in the sediments include quartz, feldspar, kaolinite, montmorillonite, illite, chlorite, mixed-layer clays, calcite, dolomite and iron hydroxides. Such a complex lithological composition is bound to create problems in well log interpretation when calibration data are scarce.

III. DEVELOPMENT

The exploration of Cerro Prieto was initiated in 1961 with the drilling of a number of wells to establish the feasibility of producing steam. The second phase of the exploration activities was undertaken in 1964 when two out of four wells drilled were producers (M-3 and M-5). This success led to the next phase, the development of the field, and has continued up to the present.

As of the date of this study, a total of 55 wells have been drilled in the Cerro Prieto Field, of which 42 are producers. Most of the wells have been logged, although wellbore problems have precluded the implementation of a complete logging program.

According to the list published,[7] a typical suite of logs for individual wells consists of Induction Electric Survey, Dual Induction Laterolog, Compensated Formation Density, Compensated Neutron Log and Saraband. No acoustic logs are listed in this inventory. Temperature logs have either not been run on most wells or the ones run were not made available to us except for two wells.

From the LBL inventory we acquired the logs listed in Table I. For the purpose of our study we were interested in the balloon or large scale version of the logs (5 inches = 100 ft.). The wells and the intervals marked with asterisks are the logs with the large scale which were analyzed in the study.

IV. OBJECTIVE OF THE STUDY

This study was initiated to test the application of oilfield type well-log interpretation techniques to the Cerro Prieto Geothermal Field. The first task

TABLE I

LIST OF THE LOGS RECEIVED FROM LBL

Well	Log	Depth,** ft	Scale	Comments
M-3	Temperature	3100-7500	2" = 100'	
	"	7500-8600	2" = 100'	
M-5	Electrical	351-3813	2" = 100'	
M-14*	DIL	3130-4263	5" = 100'	Mexico***
	IES	842-3142	5" = 100'	Mexico
	FDC	3142-4268	2" = 100'	
	Comp. NFD	3130-4268	5" = 100'	
	Saraband	3150-4252	5" = 100'	
M-19A*	Electrical	189-2336	5" = 100'	Mexico
	DIL	2310-4753	5" = 100'	Mexico
	Comp. NFD	2312-4300	5" = 100'	
	Saraband	2370-4290	5" = 100'	
M-20	Electrical	500-2700	2" = 100'	
	Micro	2700-4300	5" = 100'	
M-21	Electrical	600-3600	2" = 100'	
	Micro	600-3600	5" = 100'	
	Micro	3600-4900	5" = 100'	
M-25	DIL	280-2273	2" = 100'	
	Comp. NFD	280-2277	5" = 100'	
	FDC	2250-4603	2" = 100'	
	Saraband	2260-4590	5" = 100'	
M-26	Micro	2400-4100	5" = 100'	
M-27*	- IES	900-2900	5" = 100'	Mexico
	DIL	2900-4200	5" = 100'	Mexico
	Comp. NFD	2900-4200	5" = 100'	
	Saraband	3000-4200	5" = 100'	
M-29*	Electrical	600-3470	2" = 100'	
	DIL	3438-4185	2" = 100'	
	Comp. NFD	3446-4190	5" = 100'	
	Comp. FD	3446-4190	2" = 100'	
	DIL	3446-4185	5" = 100'	
M-30	Electrical	500-2300	5" = 100'	
	FDC	500-2300	5" = 100'	
	DIL	2300-4900	5" = 100'	
M-31	Electrical	600-3500	5" = 100'	
	Micro	600-3500	5" = 100'	

Well	Log	Depth, ft	Scale	Comments
M-35	DIL	500-2100	5" = 100'	
	Comp. CNL	500-2100	5" = 100'	
	FDC	500-2100	5" = 100'	
	Saraband	600-2100	5" = 100'	
	Saraband	2500-4500	5" = 100'	
M-38	Electrical	600-3600	5" = 100'	
	"	3600-4900	2" = 100'	
	Micro	600-3600	5" = 100'	
	Micro	3600-4800	5" = 100'	
M-39	Electrical	100-4916	2" = 100'	
	Micro	600-4915	2" = 100'	
M-42*	IES	600-3600	5" = 100'	
	DIL	2600-4300	5" = 100'	
	Comp. NFD	2600-4300	5" = 100'	
M-45*	Electrical	600-2400	2" = 100'	
	IES	600-2400	5" = 100'	
	Comp. NFD	2400-4600	5" = 100'	
	FDC	2300-4600	5" = 100'	
	DIL	2400-4600	5" = 100'	Mexico
	Saraband	2500-4500	5" = 100'	
M-46	IES	644-2788	5" = 100'	Mexico
	DIL	2770-4661	5" = 100'	Mexico
	FDC	2770-4667	5" = 100'	
M-51	Electrical	511-2315	5" = 100'	
	DIL	2305-5248	2" = 100'	
	Saraband	2310-5240	5" = 100'	
M-53	DIL	762-3605	2" = 100'	
	DIL	3601-6210	2" = 100'	
	Saraband	815-3590	5" = 100'	

*Wells analyzed here.

**Depth as recorded in ft.

*** Logs obtained directly from Mexico.

was to examine the quality of the log in view of the hostile conditions existing in the wellbore. Next, we interpreted the logs and derived certain rock and fluid properties. Finally, we compared the computed results with data available from other published studies.

The parameters of interest included formation rock porosity, shale content, reservoir temperature, and formation brine salinity.

In the course of this study we identified the deficiencies of available data and recommended improvements which should be incorporated in future borehole geophysical surveys. Also, we identified the major improvements necessary to upgrade existing correlations and equations.

V. REVIEW OF EXISTING DATA

Scientists and researchers, with varieties of backgrounds and interests, have studied the Cerro Prieto Geothermal Field. A review of published literature shows that the major studies fall into one of the following categories: geophysical, geochemical, geological, or reservoir engineering.

Very little has been published about the interpretation of geophysical logs although there is evidence that both Mexican and U S agencies have done various studies on such logs.

Required for our study and subsequent comparative analysis were certain data on core analysis, drilling, temperature, and fluid analysis.

Except for several geochemical studies,[8] very little data about the rock properties have been published. Elders and his co-workers conducted a significant study on fragments of reservoir rock.[6] This study clearly showed the hydrothermal alteration of deep rocks and a corresponding change in the mineralogy. But actual core analyses with reservoir rock porosity and permeability data are scarce.

Temperature log data reflect the unequilibrated condition in the borehole. However, from various reports and publications indications are that the deep formation temperatures may range from 204-315°C (400-600°F).[4,9]

Copies of drilling summaries accompanied the well logs. The summaries for the cases analyzed in this report are included in Appendix D. Since the well logs under our study represent the early wells drilled in the area, information about the drilling mud composition and properties are sketchy. With the newer wells, a programmed mud composition is established in advance of drilling.

VI. METHOD OF STUDY

The well logs were interpreted using a combination of graphic and numerical studies. Graphic studies were aimed at checking the quality of the logs, and analyzing the trend and certain overlays. Numerical studies included the digitization of logs, determination of certain rock and fluid properties through the use of a specially developed computer program* and the use of various cross plots.

The numerical studies reported here include only four wells which had relatively complete suites of logs at the time of the study. The graphical studies were extended to other wells with partial well logs. Figure 2 shows the location of the four wells in the field.

A. Graphic Studies

The first task in the category was the quality check on the logs. The calibrations were checked by scrutinizing the repeat sections recorded on the bottom of the logs as well as by analyzing the errors associated with high and low calibration points and recorder offset error.

As shown in Appendix A, most logs in the series seem to be of acceptable quality. Unfortunately, the repeat sections were not available on all of the logs. Because of temperature effects on the tool and the recorded data, it is imperative that the repeat sections be included for all runs. The examination of the repeat sections can be very educational in understanding the behavior of measurement devices under adverse environments.

A very important lithology log in the analysis of sand-shale series is the Self-Potential log. A routine comparison of the Self-Potential log with corresponding Gamma-Ray log recorded with a Compensated Formation Density or Compensated Neutron Log may be extremely helpful in judging the quality of the Self-Potential log. Our graphical overlays of these two logs for most of the wells indicate that a high degree of reliability exists in the Self-Potential logs.

In only a few cases we have observed discrepancies between the Gamma Ray and the Self-Potential logs. Figure 3 shows an example of such a case for Well M-25. While the Gamma Ray strongly suggests the presence of low radioactivity (sand), the Self-Potential log shows the existence of an impermeable formation. There are several possible reasons for this effect. First, these

*A listing of the computer program is available upon request.

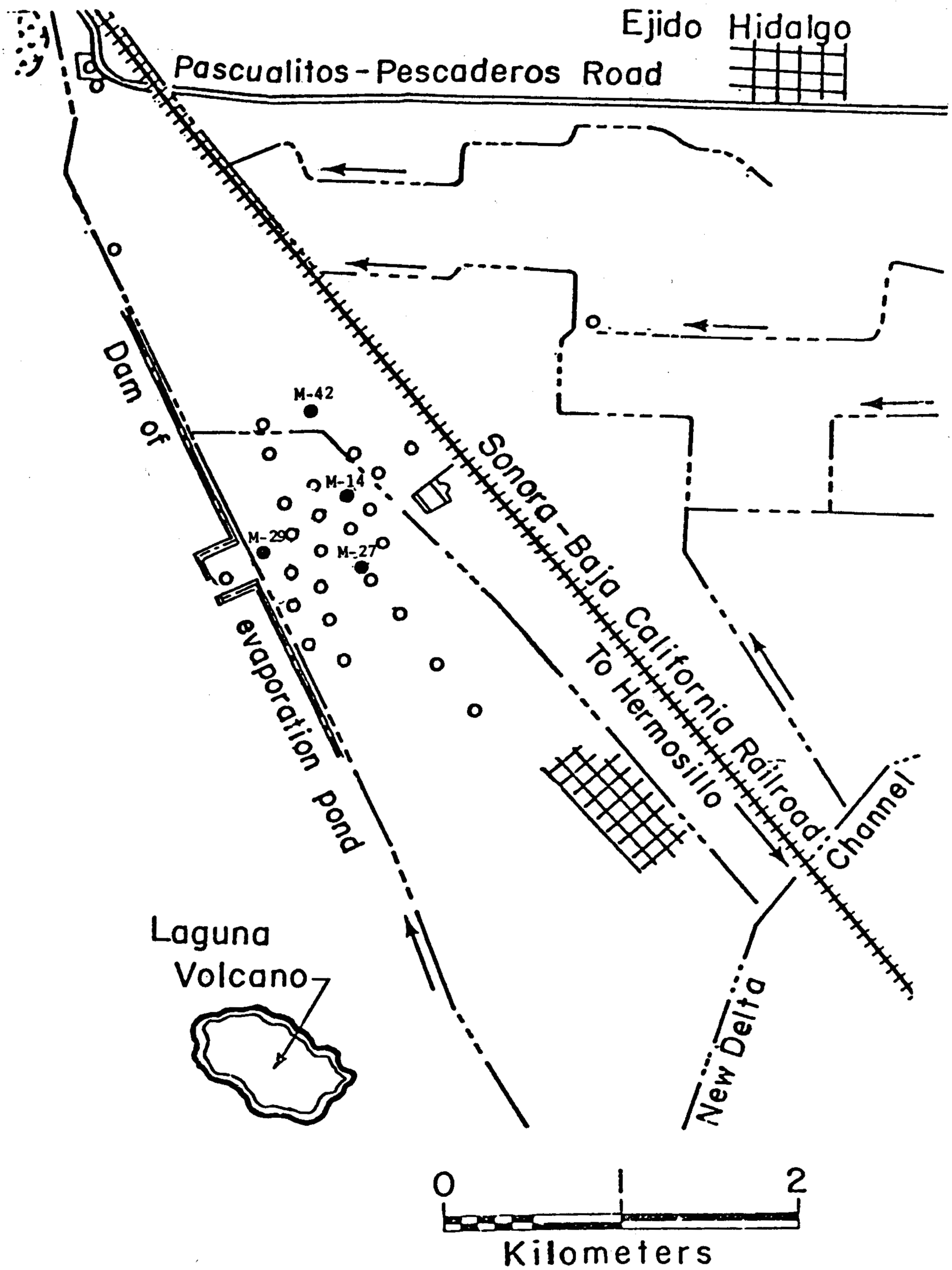

Fig. 2. Location of the 4 wells studied in this report.

intervals could be impermeable layers such as anhydrite or carbonates. Such impermeable layers would cause extremely high resistivity readings on the deep induction log. Second, a change in salinity of water in the formation or in the mud, may cause the activity ratio $(\frac{a_{mfe}}{a_{we}})$ to approach unity and may result in insignificant SP. (For a description of the activity ratio see the Self-Potential equation in Appendix C.) Since there is no evidence of unusually high values for the deep induction readings, there may have been a change in either the formation water resistivity or drilling mud composition. Such sections were not analyzed because of inadequate data about the drilling conditions and mud composition.

Another observation of significant importance is the gradual changes in the trend of deep induction log with depth. In most wells, the deep induction log indicates increasing electrical resistivity or decreasing electrical conductivity with depth. Since increasing temperature with depth would result in increasing conductivity or decreasing resistivity, some other factor must be responsible for this effect. One possible explanation, supported by studies of the Self-Potential logs and further substantiated by Elder's data, is the gradual phasing out of the shale's contribution to the overall rock conductivity. Hydrothermal alteration of rocks and exposure of clays to extreme temperature will essentially make them inactive in terms of electrical conductivity. This observation on the induction log can be of considerable importance in correlating the wells for establishing the starting depth of hydrothermal alteration. Figure 4 shows a sample log depicting the above condition for Well M-19A.

B. Numerical Studies

The usual approach to well log interpretation consists of collection of the raw data, selection of the suitable equations, and through the use of manual or computerized techniques, conversion of the raw data into basic rock and fluid properties. At this point, the experience in well log interpretation and a familiarity with the given field, influence the final interpretation. The more experience, the more reliable should be the final outcome.

We recognize that complex lithology presents a problem for this study. The problem is perhaps more severe here because of the possible existence of nongranular (fracture) porosity and permeability.

Because of inadequate data, a new approach was devised to study the well logs. Resistivity of the formation brine (R_w) was selected as the control

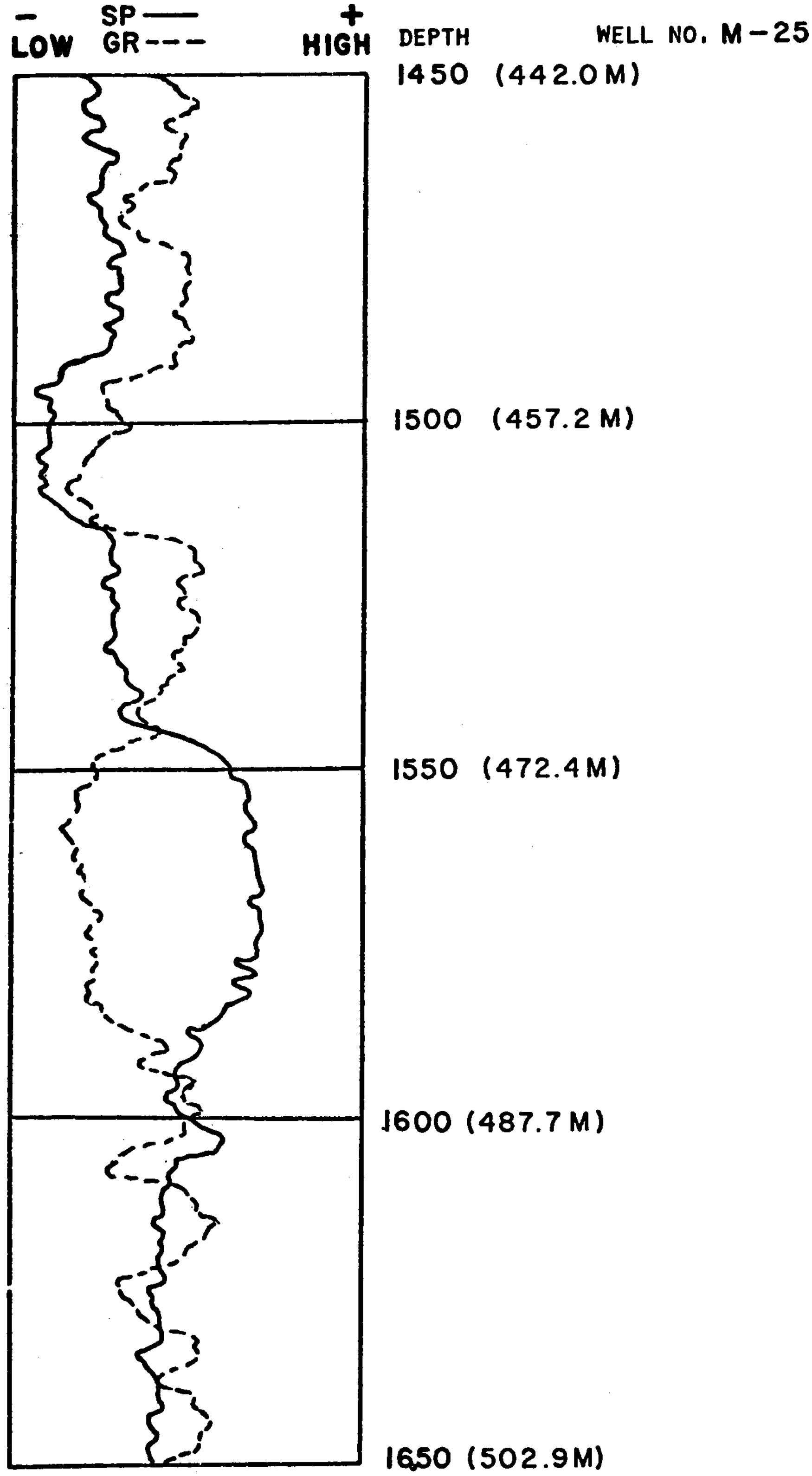

Fig. 3. SP-Gamma Ray Overlay for Well M-25.

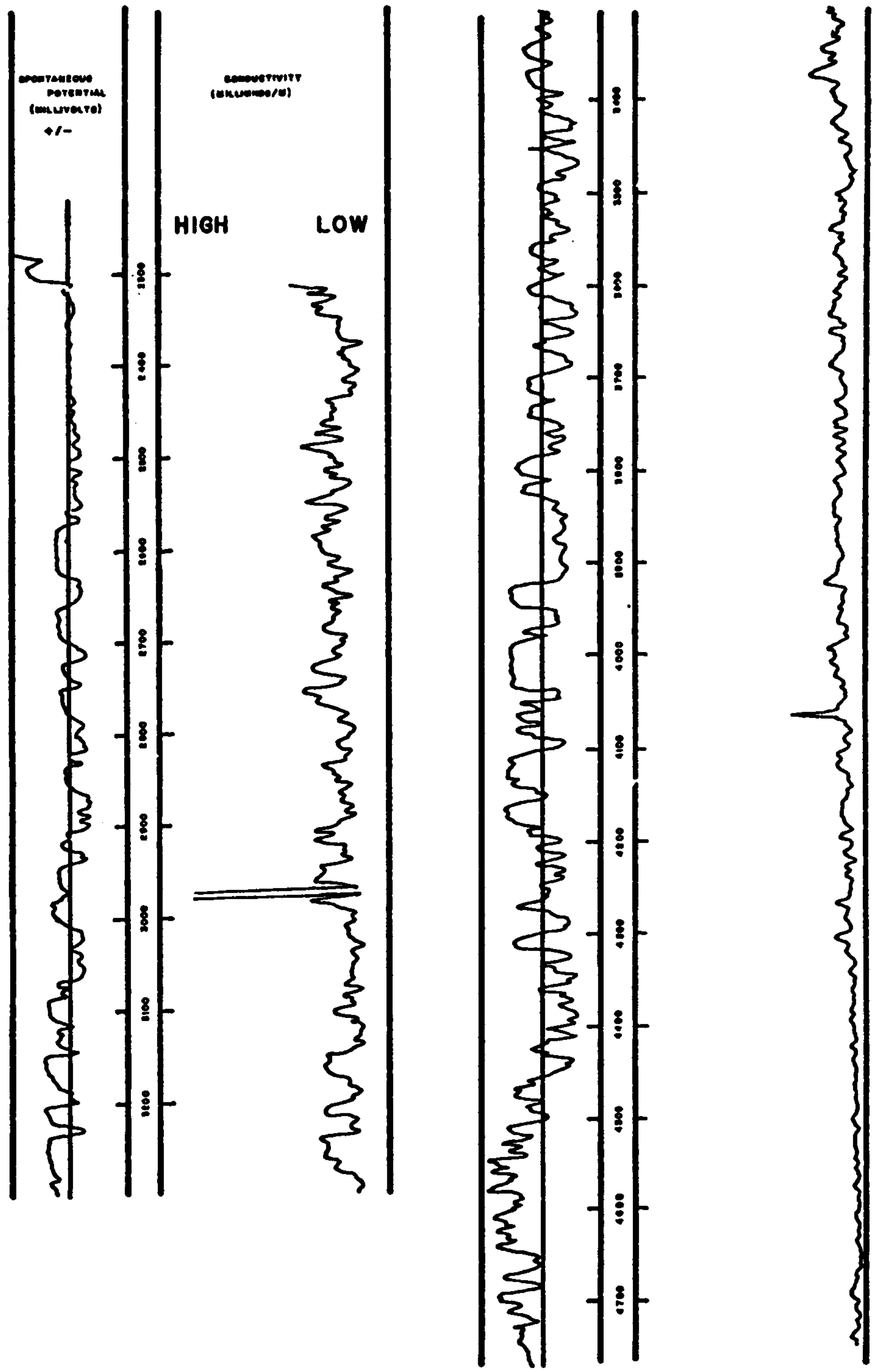

Fig. 4. Induction-Electric Log for Well M-19.

parameter. With adequate data, apparent R_w (R_{wa}) computed from Self-Potential, invaded zone resistivity (R_{xo}), and deep formation resistivity (R_t) should be identical. Equations relating R_{wa} to log derived values from the three approaches cited above, however, include other input parameters about the formation lithology, drilling fluid properties, and temperature profile. We used a trial and error technique to arrive at these unknown parameters. Since in most cases the problem may have multiple solutions, the optimum answers were selected in accordance with other known and published data about the field.

Appendix B shows a summary of all equations used in the computations. In brief, from the Dual-Induction Laterolog data, R_t, R_{xo} and D_i were computed, then:

$$F_{xo} = \frac{R_{xo}}{R_{mff}} \quad , \tag{1}$$

where R_{mff} is the R_{mf} (resistivity of mud filtrate) at formation temperature. From this estimation of F_{xo} and the R_t data, an estimate of R_{wa} may be obtained, which in this report is referred to as R_{wax}. Also from the Self-Potential data, an estimate of R_{wa} may be obtained which is called here R_{wsp}. The cross plot of ϕ_D vs ϕ_N provides estimates of VSH (fraction of shale content), and effective and total porosity. Using the equation for shaly sand, an estimate of R_{wa} may be obtained from the R_t data incorporating the contribution of the surface conductivity by clay material.

To obtain an acceptable match between R_{wsp} and R_{wax}, an optimum R_{mf} is determined from the following quadratic equation.

$$A\, R_{mf}^2 + B\, R_{mf} + C = 0 \quad , \tag{2}$$

where

$$A = 286.45 \frac{R_t}{R_{xo}\ \text{Ratio}} \tag{3}$$

$$B = 146 \frac{R_t}{R_{xo}} - \frac{65.45}{\text{Ratio}} \tag{4}$$

$$C = -5 \tag{5}$$

$$\text{Ratio} = 10^{-SP/(60\, +\, .133T)} \quad . \tag{6}$$

The above equation may be derived by equating R_{wsp} and R_{wax} from their corresponding relationships:

$$R_{wsp} = \frac{77 \dfrac{R_{mfe}}{Ratio} + 5}{146 - 337 \dfrac{R_{mfe}}{Ratio}} , \tag{7}$$

where

$$R_{mfe} = 0.85 \; R_{mf} , \tag{8}$$

$$R_{wax} = \frac{R_t}{R_{xo}} R_{mf} . \tag{9}$$

Upon determination of the optimum R_{mf} at a given T, attention was focused on R_{wad} calculation:

$$R_{wad} = \frac{\phi_e}{\phi_t \left[\dfrac{F}{R_t} - \dfrac{\phi_t - \phi_e}{\phi_t} \dfrac{1}{R_{wcly}} \right]} . \tag{10}$$

Equation (10) considers the contribution of clay to the overall conductivity.[11]

Both ϕ_D and ϕ_t are functions of ϕ_{NC}, ϕ_{DC}, ρ_{WC}, ρ_{DC}. Parameters a and m also enter into the equation for F.

1. The Simulation Program. A computer program was developed to perform the computations for a given interval and for a set of assumed parameters. The general structure of the program is illustrated in the flow diagram of Appendix B.

Under option 1 mode, the purpose is to read the basic log derived values and print cross plots of ϕ_D vs ϕ_N. From the cross plot, the values of ϕ_{DC}, ρ_{NC}, and ρ_{WC} may be obtained by graphical construction as discussed by Krug and Cox.[10] The program is then run under option 2 mode where assumed values of a, m, T, and R_{wcly} are used. By switching ITCOD = 1, the program will use the temperature data based on the bottom hole temperature recorded on the logs. If higher temperatures are employed, the ITCOD is set at 2.

The computation includes the determination of R_t, R_{wsp}, R_{wax}, ϕ_e, ϕ_t, VSH, R_{wad} and S_w. During the first trial runs, the emphasis is on closing the gap between R_{wsp} and R_{wax}. This is mainly controlled by adjustment of T and R_{mf}

data. For a given T, using the method described earlier, the program prints R_{mfx}. This, according to the program, is the optimum R_{mf} at the given reservoir temperature that would result in exact identity between R_{wsp} and R_{wax}. An average of these values converted to the surface temperature is used in subsequent runs.

Once reasonable agreement between R_{wsp} and R_{wax} is reached, the emphasis is then focused on R_{wad}. The process here is somewhat more complicated because there are a number of parameters that could be varied. This includes basic shale properties as determined from the cross plots of ϕ_D vs ϕ_N, a and m.

2. Estimation of Formation Water Salinity. Formation water resistivities as computed from three different techniques may be converted to equivalent NaCl concentration. The following equation based on published data in most well logging handbooks was derived and used in the computation of equivalent NaCl concentration:

$$\text{SALLY} = e^{(8.6045 - 1.06156\,\text{Log}(R_w) + .0188(\text{Log}\,R_w)^2)} \quad , \qquad (11)$$

where R_w is the water resistivity at 23.9°C (75°F) and SALLY is the equivalent NaCl salinity in ppm.

To convert the R_w at formation temperature to R_w at 23.9°C (75°F), we used the Arps[12] approximation formula:

$$R_{w\,75} = R_{w\,T_f}\,\frac{T_f + 7}{82} \quad . \qquad (12)$$

Recently published laboratory data,[13] however, indicate that the above equation may cause erroneous results when applied for temperatures above 260°C (500°F). The use of the Arps equation in our computation was justified because for cases studied, temperatures less than 260°C (500°F) were assumed.

Computation of salinity enabled us to amplify the variation in R_w and get a better match from the three techniques. As mentioned earlier, the computed salinities represent the equivalent NaCl concentration. The actual salinities may be lower or higher depending on the type of the brine composition.

3. Temperature Profile. During the logging operation, estimation of temperature in the borehole and the temperature profile into the formation is of utmost necessity. The conventional approach of recording bottomhole temperature is not adequate for accurate interpretation of resistivity logs. The borehole temperature at any given point follows a logarithmic function of time and eventually should approach the deep formation temperature.[14] Meanwhile, the temperature profile between the extremes, that is, the borehole and the deep formation is continuously changing. This change would influence the resistivity log readings depending on the depth of investigation of the tool.

For most of the Cerro Prieto wells under our study, the deep formation temperature has been reported to range from 204°C to 315°C (400-600°F). At the same time, the recorded bottomhole temperatures (because of downhole cooling of the mud) are generally lower than 121°C (250°F).

In the absence of accurate temperature data, one may assume values and by trial-and-error establish the validity of such assumptions.

VII. RESULTS OF NUMERICAL STUDIES

A total of four wells have been analyzed and reported here. This included M-14, M-27, M-29, and M-42. We had access to the Dual Induction Laterolog, Formation Density Compensated, Compensated Neutron Log, and Saraband logs for these wells. In general, the Self-Potential log conforms to the Gamma Ray log and the invasion diameter seems sufficient to justify the application of the proposed method.

A copy of the drilling report summaries and computer printouts for these wells is included in Appendix D. To minimize the bulkiness of the report, for each well a few permeable sections were selected representing shallow, medium and deep intervals.

A summary of trial runs on Well 14 is shown in Table II. Two sections of the well have been analyzed here. The shallow sand is located in the depth range of 1017-1031 m (3338-3384 ft.) and the deep sand is at 1099-1113 m (3606-3652 ft.). Using the R_{mf} data as indicated on the log heading (1.34 ohm-m at 21.6°C (71°F)) and applying a temperature based on recorded BHT (bottomhole temperature) during logging (T = 107°C or 225°F), the average R_{wax} differs significantly from the R_{wsp} and R_{wad}. Increasing the temperature to 260°C (500°F) improves the match somewhat. Since there is an upper limit one could assign to reservoir temperature, the next alternative is to use R_{mfx} values as computed by the program. When corrected to a surface temperature of 21.6°C (71°F) a value of R_{mf} = 0.37 ohm-m is obtained. Using this new value of R_{mf}, the R_w match improves substantially as shown in Table 14-3 and plotted in Fig. 14-3. Reducing the R_{mf} to 0.344 ohm-m at 23.9°C (75°F) would allow a reduction of the assumed value for reservoir temperature to 232.2°C (450°F) and still maintain a good match (See Table 14-4 and Fig. 14-4). Similar results are evident for the deep sand 1099-1113 m (36-6-3652 ft.). The general conclusion at this point is that the R_{mf} values reported on the log heading are not representative of actual bottomhole mud composition. A possible cause for this discrepancy is the heterogeneous nature of the mud column. According to the drilling report, the mud column had been cooled down by using ice to ease the logging operation.

As shown for Well 14 and other wells, the use of low temperatures results in great discrepancies among the computed R_{wa}'s. For example, in Table III for Well 27, the change of temperature from 94.4°C (202°F) to an estimated 232.2°C (450°F) improves the match between the three R_{wa}'s significantly (compare run 27-1 with 27-5 and 27-8 with 27-9).

Generally the optimum temperatures seem to be much higher than the wellbore temperature and lower than the deep reservoir temperature indicating a slight cooling in the immediate vicinity of the wellbore.

Another controlling factor in achieving a match is the value for exponent m (cementation factor). A quick glance at the Tables II through IV indicates that we have used m = 2.3 in most cases. This is an estimate obtained after many trial runs. The sensitivity of computations with respect to the estimated value of m is shown for a few cases. Notice R_{wad} increases in the interval of 927-939 m (3042-3080 ft.) for Well 42 when only m is reduced and other parameters remain unchanged.

A major consideration in the selection of the appropriate parameters is the examination of computed S_w. By and large, S_w values above unity are unacceptable. In cases where an optimum match between the three R_{wa},s has been obtained, we have observed S_w values of one or less. Ordinarily, for a liquid dominated system, one expects the formation to be saturated one hundred percent with liquid. However, the presence of free gases such as CO_2, N_2, and CH_4 in the system may result in computed S_w values less than unity.

TABLE II

SUMMARY OF COMPUTED RESULTS WELL M-14

$\phi_{DC} = 0.01$ $\phi_{NC} = 0.21$ $\rho_{DC} = 2.8$ gm/cc $\rho_{WC} = 2.62$ gm/cc

Interval m(ft)	R_{mf} (ohm-m) at	T_{mf} °C (°F)	T_f °C (°F)	a	m	R_{wcly}* (ohm-m)	R_{sh}* (ohm-m)	Avg. R_{WSP}* (ohm-m)	Avg. R_{WAX}* (ohm-m)	Avg. R_{WAD}* (ohm-m)	(Appendix D) Table No.
1017-1031 (3338-3384)	1.34	21.6(71)	107(225)	1	2.3	0.1	1.5	0.07	0.35	0.05	14-1
1017-1031	1.34	21.6(71)	260(500)	1	2.3	0.1	1.5	0.065	0.16	0.05	14-2
1017-1031	0.37	23.9(75)	260(500)	1	2.3	0.1	1.5	0.04	0.05	0.05	14-3
1017-1031	0.334	23.9(75)	232.2(450)	1	2.3	0.1	1.5	0.04	0.045	0.05	14-4
1099-1113 (3606-3652)	1.34	21.6(71)	260(500)	1	2.3	0.1	1.5	0.06	0.15	0.05	14-5
1099-1113	1.34	21.6(71)	232.2(450)	1	2.3	0.1	1.5	0.06	0.18	0.05	14-6
1099-1113	0.37	23.9(75)	260(500)	1	2.3	0.1	1.5	0.04	0.05	0.05	14-7
1099-1113	0.334	23.9(75)	232.2(450)	1	2.3	0.1	1.5	0.04	0.05	0.05	14-8

*At formation temperature

TABLE III

SUMMARY OF COMPUTED RESULTS WELL M-27

$\phi_{DC} = 0.04$ $\phi_{NC} = 0.29$ $\rho_{DC} = 2.8$ gm/cc $\rho_{WC} = 2.544$ gm/cc

Interval m(ft)	R_{mf} (ohm-m) at	T_{mf} °C (°F)	T_f °C (°F)	a	m	R_{wcly}* (ohm-m)	R_{sh}* (ohm-m)	Avg. R_{WSP}* (ohm-m)	Avg. R_{WAX}* (ohm-m)	Avg. R_{WAD}* (ohm-m)	(Appendix D) Table No.
923-934 (3030-3064)	0.5	23.9(75)	94.4(202)	1	2.3	0.1	1.5	0.06	0.16	0.06	27-1
923-934	0.3	23.9(75)	232.2(450)	1	2.3	0.1	1.5	0.04	0.04	0.06	27-2
923-934	0.3	23.9(75)	232.2(450)	1	2.0	0.1	1.5	0.04	0.04	0.09	27-3
923-934	0.3	23.9(75)	232.2(450)	1	2.5	0.1	1.5	0.04	0.04	0.05	27-4
923-934	0.5	23.9(75)	232.2(450)	1	2.3	0.1	1.5	0.05	0.07	0.06	27-5
923-934	0.5	23.9(75)	232.2(450)	1	2.5	0.1	1.5	0.05	0.07	0.05	27-6
923-934	0.5	23.9(75)	232.2(450)	1	2.0	0.1	1.5	0.05	0.07	0.08	27-7
1106-1122 (3630-3680)	0.5	23.9(75)	134.4(274)	1	2.3	0.1	1.5	0.05	0.14	0.06	27-8
1106-1122	0.5	23.9(75)	232.2(450)	1	2.3	0.1	1.5	0.05	0.09	0.06	27-9
1106-1122	0.5	23.9(75)	260(500)	1	2.3	0.1	1.5	0.05	0.08	0.06	27-10
1106-1122	0.5	23.9(75)	260(500)	1	2.5	0.1	1.5	0.05	0.07	0.05	27-11
1272-1278 (4174-4194)	0.5	23.9(75)	170(338)	1	2.3	0.1	4	0.05	0.09	0.06	27-12
1272-1278	0.5	23.9(75)	232.2(450)	1	2.3	0.1	4	0.05	0.07	0.06	27-13
1272-1278	0.5	23.9(75)	232.2(450)	1	2.0	0.1	4	0.05	0.06	0.07	27-14

*At formation temperature

TABLE IV

SUMMARY OF COMPUTED RESULTS WELL M-29

$\phi_{DC} = 0.05$ $\phi_{NC} = 0.35$ $\rho_{DC} = 2.8$ gm/cc $\rho_{WC} = 2.5175$ gm/cc

Interval m(ft)	R_{mf} (ohm-m) at	T_{mf} °C (°F)	T_f °C (°F)	a	m	R_{wcly}* (ohm-m)	R_{sh}* (ohm-m)	Avg. R_{WSP}* (ohm-m)	Avg. R_{WAX}* (ohm-m)	Avg. R_{WAD}* (ohm-m)	(Appendix D) Table No.
1059-1068 (3476-3504)	0.3	23.9(75)	96.1(205)	1	2.3	0.1	1.6	0.050	0.06	0.04	29-1
1059-1068	0.3	23.9(75)	176.6(350)	1	2.3	0.1	1.6	0.045	0.04	0.04	29-2
1059-1068	0.3	23.9(75)	232.2(450)	1	2.3	0.1	1.6	0.04	0.03	0.04	29-3
1059-1068	0.3	23.9(75)	287.7(550)	1	2.3	0.1	1.6	0.04	0.025	0.04	29-4
1147-1157 (3764-3798)	0.3	23.9(75)	116.6(242)	1	2.3	0.1	1.6	0.05	0.04	0.05	29-5
1147-1157	0.3	23.9(75)	204.4(400)	1	2.3	0.1	1.6	0.05	0.02	0.05	29-6
1204-1217 (3952-3994)	0.3	23.9(75)	129.4(265)	1	2.3	0.1	1.6	0.05	0.035	0.055	29-7
1204-1217	0.3	23.9(75)	204.4(400)	1	2.3	0.1	1.6	0.04	0.025	0.05	29-8
1204-1217	0.5	23.9(75)	204.4(400)	1	2.3	0.1	1.6	0.05	0.045	0.06	29-9
1204-1217	0.5	23.9(75)	129.4(265)	1	2.3	0.1	1.6	0.05	0.06	0.06	29-10
1240-1248 (4070-4096)	0.3	23.9(75)	138.9(282)	1	2.3	0.1	1.6	0.05	0.04	0.055	29-11
1240-1248	0.3	23.9(75)	204.4(400)	1	2.3	0.1	1.6	0.04	0.035	0.055	29-12
1240-1248	0.5	23.9(75)	204.4(400)	1	2.3	0.1	1.6	0.05	0.05	0.055	29-13

*At formation temperature

TABLE V

SUMMARY OF COMPUTED RESULTS WELL M-42

ϕ_{DC} = 0.07 ϕ_{NC} = 0.36 ρ_{DC} = 2.8 gm/cc ρ_{WC} = 2.465 gm/cc

Interval m(ft)	R_{mf} (ohm-m) at	T_{mf} °C (°F)	T_f °C (°F)	a	m	R_{wcly}* (ohm-m)	R_{sh}* (ohm-m)	Avg. R_{WSP}* (ohm-m)	Avg. R_{WAX}* (ohm-m)	Avg. R_{WAD}* (ohm-m)	(Appendix D) Table No.
815-825 (2674-2708)	0.3	23.9(75)	73.8(165)	1	2.3	0.1	1.0	0.05	0.08	0.05	42-1
815-825	0.3	23.9(75)	204.4(400)	1	2.3	0.1	1.0	0.04	0.04	0.05	42-2
815-825	0.3	23.9(75)	204.4(400)	1	2.4	0.1	1.0	0.04	0.04	0.05	42-3
927-939 (3042-3080)	0.3	23.9(75)	204.4(400)	1	2.3	0.1	1.0	0.04	0.03	0.035	42-4
927-939	0.3	23.9(75)	204.4(400)	1	2.4	0.1	1.0	0.04	0.03	0.03	42-5
927-939	0.3	23.9(75)	204.4(400)	1	2.5	0.1	1.0	0.04	0.03	0.025	42-6
927-939	0.3	23.9(75)	204.4(400)	1	2.0	0.1	1.0	0.04	0.03	0.05	42-7
1162-1170 (3814-3840)	0.3	23.9(75)	126.6(260)	1	2.3	0.1	2.0	0.04	0.04	0.06	42-8
1162-1170	0.3	23.9(75)	204.4(400)	1	2.3	0.1	2.0	0.04	0.03	0.06	42-9
1162-1170	0.5	23.9(75)	204.4(400)	1	2.3	0.1	2.0	0.05	0.05	0.06	42-10

*At formation temperature

With slight variations from well to well in terms of optimum estimated value of R_{wad} and reservoir temperature, indications are that by and large a salinity of 20,000-30,000 ppm (equivalent NaCl) prevails in formation water. This is in line with geochemical studies reported by other investigators.[8] One must note, however, that measurements made at surface are bound to result in somewhat different salinities because of the changes in the thermodynamic conditions of the produced fluid.

Lithology of the formation was briefly examined in the study. First using the cross plot of ϕ_D vs ϕ_N and as shown in part II of Appendix C, we determined the VSH parameter representing the shale content. From the four wells analyzed here, the VSH values decrease with depth. This is also confirmed by the Saraband results. Also, the average matrix density of the formation was determined according to the procedure shown in part IV of Appendix C. By and large, as shown in Fig. 5-8, the average matrix density is around 2.65 or perhaps somewhat higher. A cross plot of ρ_b vs ϕ_N also shows that depending on the depth of the layers, the computed lithology varies from the sand shale series to more compact formations with ρ_b higher than 2.65. We are planning to examine this further in our future studies.

VIII. SUMMARY AND CONCLUSIONS

From the application of oilfield interpretation technology to the well logs of the Cerro Prieto Geothermal Field, we have reached the following conclusions:

1. For the sand-shale series formation, the existing technology is applicable as long as accurate estimates of formation temperature, borehole temperature, and drilling fluid properties can be established.

2. At the present time, logging tools that can survive extreme conditions of temperature and corrosive environment are not available. Consequently, the drilling fluid needs to be cooled. We recommend, therefore, that a thermistor be incorporated in all resistivity devices making it possible to record the wellbore temperature continuously during the logging operations. Such temperature data may be used to estimate formation temperature by applying the temperature buildup equation.[15] Furthermore, a continuous recording of R_m with depth is imperative for meaningful interpretation of electric logs in a constantly changing environment.

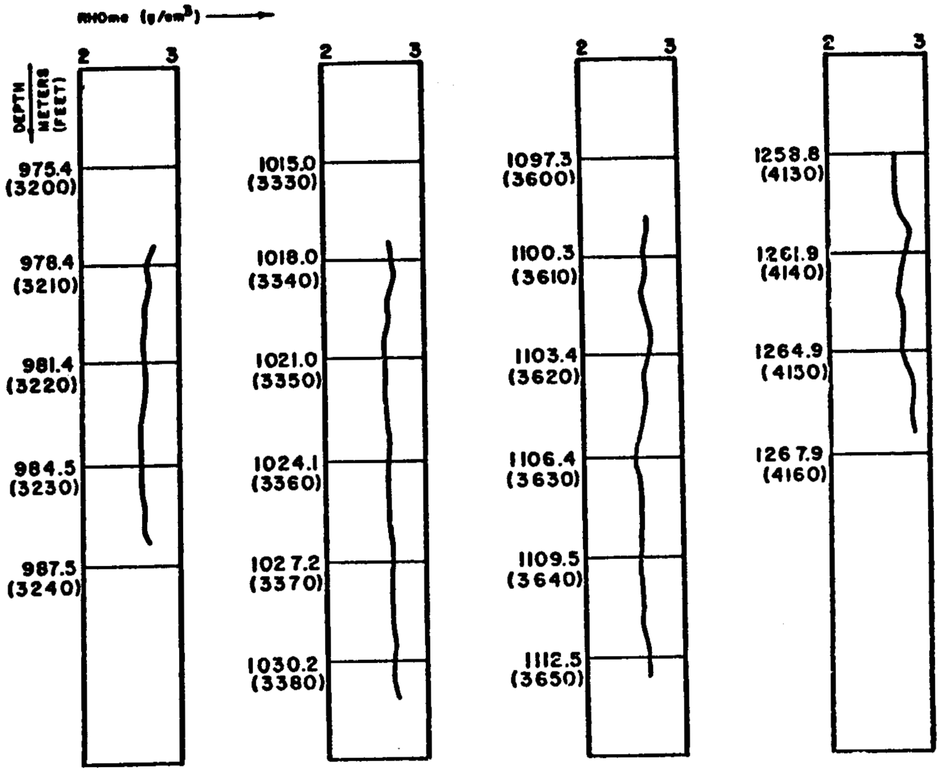

Fig. 5. Matrix density profile vs depth for Well 14.

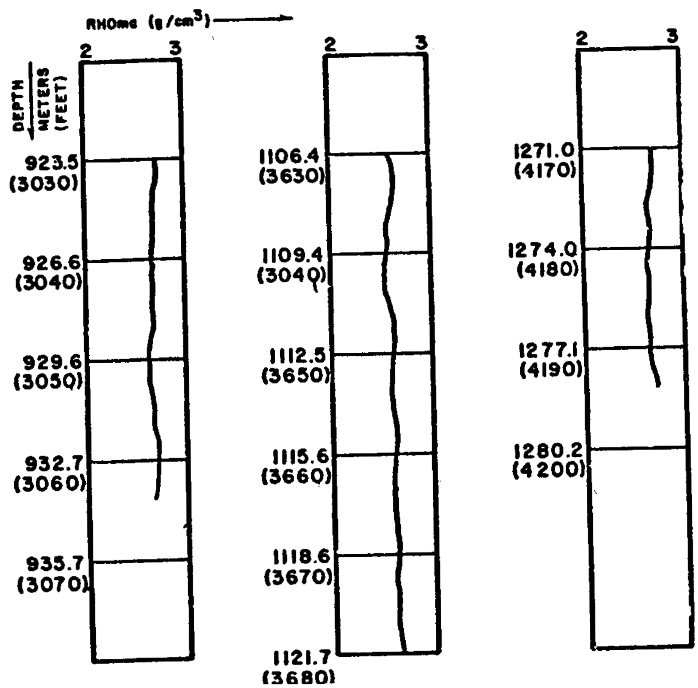

Fig. 6. Matrix density profile vs depth for Well 27.

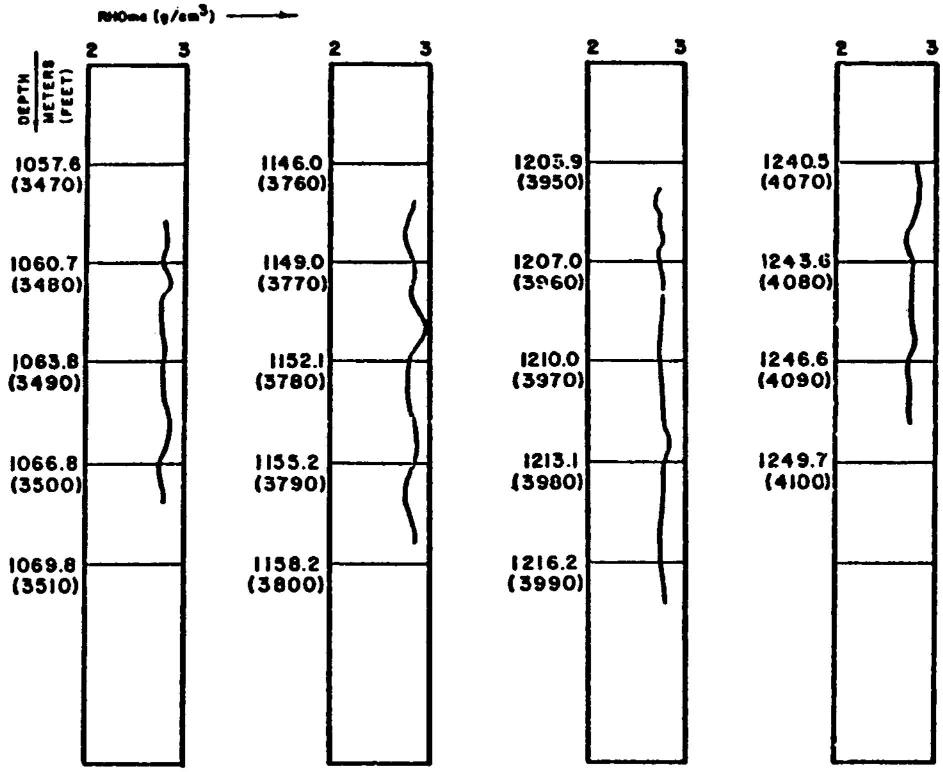

Fig. 7. Matrix density profile vs depth for Well 29.

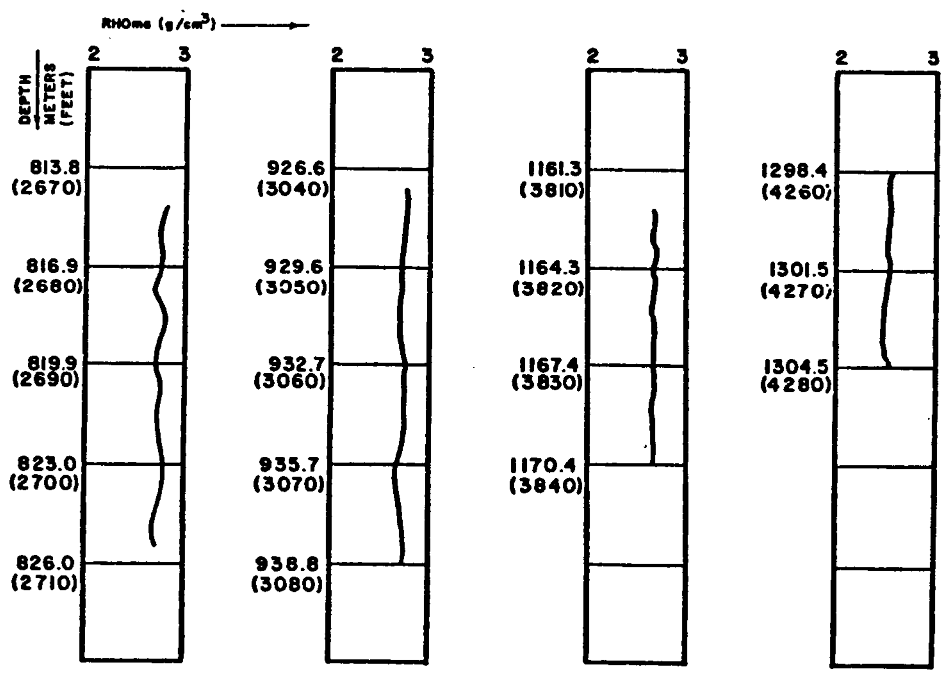

Fig. 8. Matrix density profile vs depth for Well 42.

3. Calibration checks, and in particular, repeat sections must always be included with the logs.

4. SP logs can serve an important role in establishing geological correlations. We recommend that an overlay of Gamma Ray and SP logs be made as a routine check to detect unusual lithology or trouble spots.

5. The SP equation, as currently used, needs to be re-examined in terms of the possible effect of elevated temperature on different potential components.

6. The Dual-Induction Laterolog should in all cases be preferred to a conventional IES. The invasion radius computed from the log is an additional check on testing the feasibility of using the proposed method to estimate reservoir temperature and formation fluid salinity.

7. From the computation of VSH vs depth using a cross plot of ϕ_D vs ϕ_N and combining the results with the changes of deep induction log with depth, the hydrothermal alteration of the rocks with depth may be identified.

8. The analysis presented in this report consists of using a simple geologic model for a complex lithology. The computed results represent a rough estimation of formation rock and fluid properties. Upgrading of results requires that calibration data be available for hydrothermally altered rocks and geologic models incorporating a realistic representation of the rock mineral content. Some refinements to the cross plot analysis could have been made if acoustic log data were available.

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APPENDIX A

REVIEW OF LOG QUALITY

DATA

No calibration data nor repeat sections were available for the following wells:

M-3 M-5 M-6 M-7 M-21A M-26 M-39 M-48/84

For logs for which calibration data and/or a repeat section were available for analysis, the data will be presented in the following format:

Well#	Log Type*	Repeat Section?	Match?	Calibration ?	Δ	δ	σ

.....where Δ is the high calibration point error,
δ is the low calibration point error,
and σ is the recorder offset error.....
.....as defined by Maciula and Cochran.[17-18]
Question marks are answered by Yes/No, and error function values are given in the appropriate units for the log in question (i.e., ohm-meters, resistivity units, etc.). Pertinent comments will follow each data set where necessary.
*an EL log is the earlier version of the IES log.

Well#	Log Type	Repeat Section?	Match?	?	Δ	δ	σ
M-14	DIL	Yes	Yes	Yes	0	?	0

Some ILD electric zero drift is apparent although there is a perfect repeat section match.

Well#	Log Type	Repeat Section?	Match?	?	Δ	δ	σ
	CNL	Yes	Yes	Yes	0	0	0

Two complete runs made due to tool failure on first. Excellent match where first run data available.

Well#	Log Type	Repeat Section?	Match?	?	Δ	δ	σ
M-19A	EL	No	No	No			
	FDC	No	No	No			
	DIL	Yes	Yes	Yes	0	0	0
M-20	EL	Yes	Yes	No			

Repeat on different scale, but appears to match.

Well#	Log Type	Repeat Section?	Match?	?	Δ	δ	σ
M-21	EL	Yes	Yes	No			

Repeat on different scale, but appears to match.

Well#	Log Type	Repeat Section?	Match?	?	Δ	δ	σ
M-25	DIL (to 2273')	Yes	Yes	Yes	+5	0	0
	DIL (2350-4610')	Yes	Yes	No			
	CNL	No	No	No			

Well#	Log Type	Repeat Section?	Match?	?	Calibration Δ	δ	σ
M-27	IES	Yes	Yes	Yes	0	0	0
	CNL	No	No	Yes	0	0	0
	gamma	No	No	Yes		OK	

CNL and gamma good only from 3900' down on second pass.

	DIL				see comments		

Electrical zero on sonde errors (high calibration point) both in error. Elec. Zero shifted 40 ohm-m during survey. The ILM error shifted -4 units from the surface test to the before survey test and +32 units during the run for a total drift of 28 units. The ILD errors were -35 + 70, for a total error of +35 units. <u>This log should be rerun</u>.

M-29	IES	Yes	Yes	Yes	0	0	0
	FDC	Yes	No	Yes	see comments		
	gamma	Yes	No	No			

There was no drift in the log density reading, but there was a drift of -0.1 for the change in density reading which contributed to a very small jig response error. As the repeat sections did not match for the FDC or the gamma ray, a rerun might be in order.

	CNL	Yes	No	Yes	0	0	0
M-30	IES	Yes	Yes	No			
	DIL	No	No	No			
	FDC	Yes	comments	Yes	0	0	0
	gamma	Yes	"			OK	

No surface calibration, just before and after survey. Repeat matches perfectly at times and at other times there is some small variance.

M-31	EL	Yes	Yes	No			
M-35	DIL	No	No	Yes	0	0	0
M-38	EL	Yes	Yes	No			
M-42	IES	Yes	Yes	Yes	0	0	0
	DIL	Yes	Yes	Yes	0	0	0

Surface calibration not included, but beginning and end zero traces match.

	CNL	Yes	Yes	Yes	0	0	0
	gamma	Yes	Yes	Yes		OK	

Repeat section match is not identical. All peaks in the same places, but sometimes magnitudes are not exactly the same. Differences both plus and minus.

M-45	DIL	Yes	Yes	Yes	0	0	0

After survey calibrations somewhat erratic, but averages match before values. T = 318°F.

	IES	Yes	Yes	Yes	0	0	0
	FDC	Yes	Yes	Yes	0	0	0
	gamma	No	No	No			

FDC repeat section almost identical, but some variance at times. Gamma ray not working on repeat.

Well#	Log Type	Repeat Section?	Match?	?	Δ	δ	σ
M-46	DIL	Yes	Yes	Yes	0	0	0
	CNL listed but not on log trace						
	FDC	Yes	Yes	Yes	0	0	0
	gamma	Yes	No	No			

After survey FDC calibration may be faked. Tool malfunctioned at 3200'; compensator went out, so calibration not possible unless tool started working again. Curve may be readjusted assuming constant compensator deviation and linear response, but curve may be bouncing on the tool and recorder limit. Gamma ray repeat does not match at all. T = 346°F; the tool limit is 350°F. Overall accuracy in question. All time constants check for repeat and original runs.

M-51	EL	Yes	Yes	No			
	DIL	Yes	Yes	Yes	+4	0	0

Before survey calibration shows positive error. After survey calibration is zero.

M-53	DIL	No	No	No			
	FDC	Yes	Yes	Yes	0	0	0

APPENDIX B

FLOW DIAGRAM OF THE COMPUTER PROGRAM

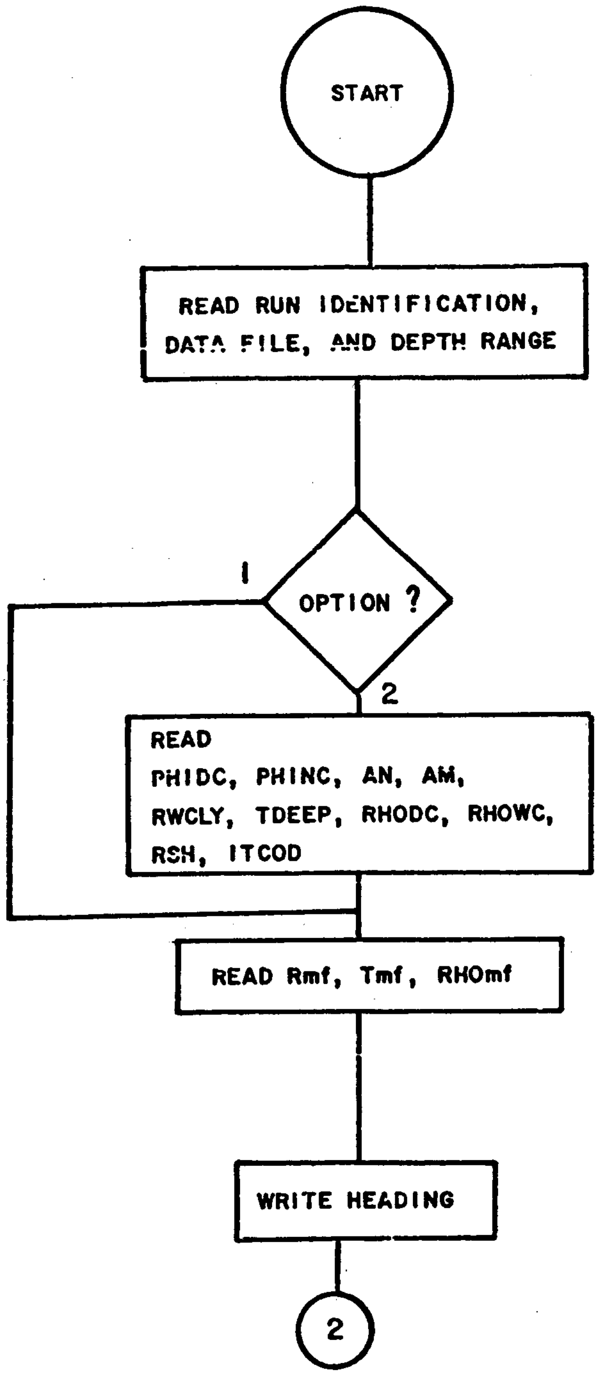

Fig. B-1. Flow Diagram of Computer Program

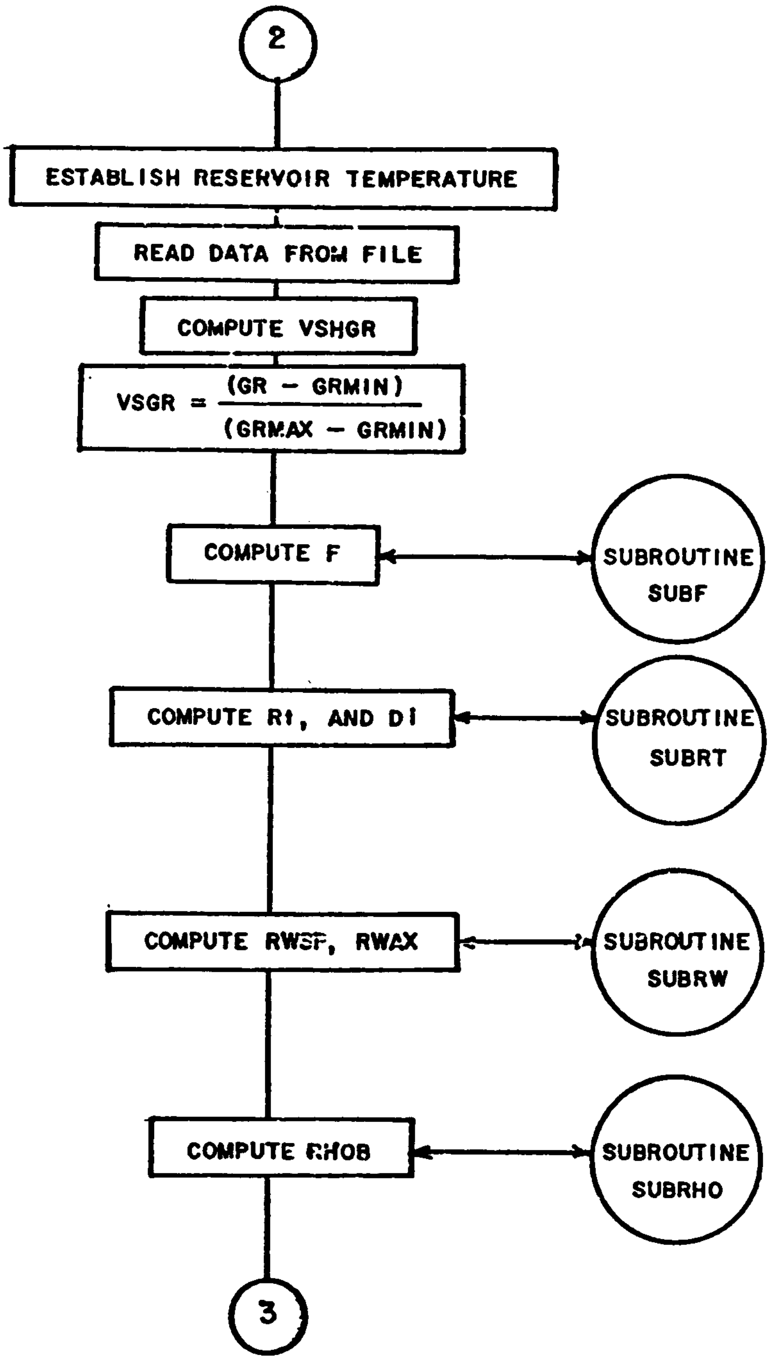

Fig. B-2. Flow Diagram (con't.)

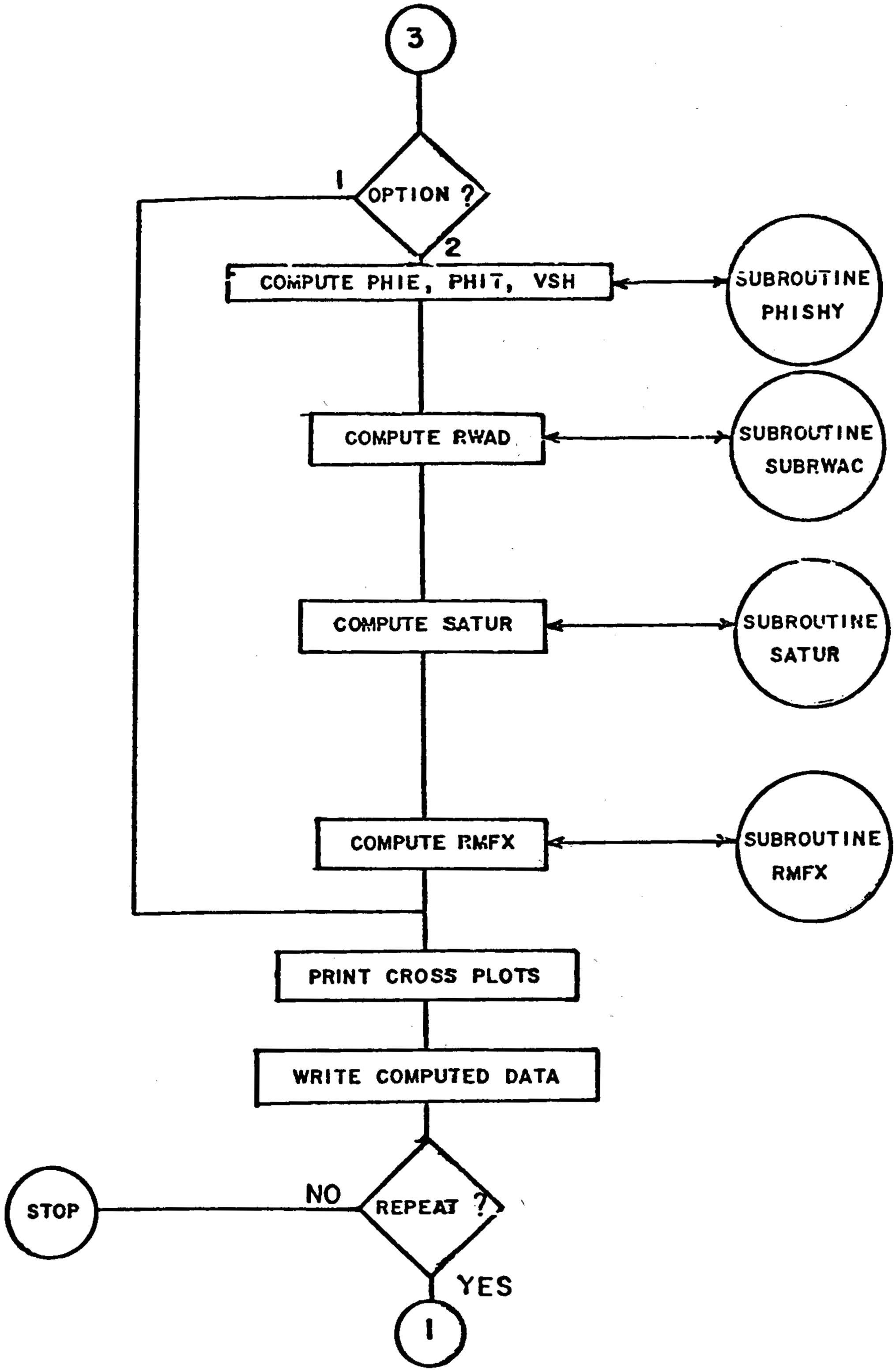

Fig. B-3. Flow Diagram (con't.).

Description of Subroutines

Subroutine	Purpose	Method Used
SUBF	Compute F	$F = a/\phi m$
SUBRT	Compute R_t, R_{xo} and Di	Part I Appendix C
SUBRW	Compute R_{wa} from S_p and R_{xo}	Part III-1 Part III-2 Appendix C
SUBRHO	Compute ρ_{ma}	Part IV Appendix C
PHISHY	Compute ϕ_e, ϕ_t, VSH	Part II Appendix C
SUBRWAC	R_{WAD}	Part III-3 Appendix C
SATUR	S_w	Part V Appendix C
RMFX	Optimum R_{mf}	Equation 2-6 Text

APPENDIX C

SUMMARY OF EQUATIONS

I. Computation of R_t and D_i from the Dual-Induction Laterolog[16]

$$R_t = R_{ILD} \times \text{Ratio}$$

where

$$\text{Ratio} = \frac{R_{ILM}\ (GID - GIM)}{GID \times R_{ILD} - GIM \times R_{ILM}}$$

$$GID = 0.0096\ D_i - 0.34 + ALPH - BET$$

$$ALPH = 10^{(0.001(156 - 53\ D_i))}$$

$$BET = 10^{(0.001(25\ D_i - 3780))}$$

$$GIM = 0.0123\ D_i - 0.212 - 0.0037\ e^{(0.04\ D_i)}$$

$$G_{LL8} = \frac{(D_i - 20)}{1.21\ D_i + 20} + 0.343$$

$$D_i = \frac{-B + \sqrt{B^2 - 4\ AC}}{2\ A}$$

$$A = Y - 0.52 \times -0.46$$

$$B = -\ (33y + 23x + 90)$$

$$C = 269\ Y + 530\ x + 1589$$

$$X = \frac{(R_{LL8} - R_{ILD})}{(R_{ILM} - R_{ILD})}$$

$$Y = \frac{(R_{LL8} - R_{ILD})}{(R_{ILM} - R_{ILD})}$$

II. Computation of VSH, ϕ_e and ϕ_t[10]

$$\phi_t = \phi_e + \text{VSH}\ \phi_e$$

$$\phi_c = \frac{(\rho_{DC} - \rho_{OWC})}{(\rho_{DC} - \rho_{OW})}$$

$$\text{VSH} = \frac{B}{AL2}$$

$$\phi_e = \frac{A}{AL1}$$

$$AL1 = \sqrt{2}\ \ \text{Sin}(\omega)$$

$$AL2 = \sqrt{\phi_{NC}^{2} + \phi_{DC}^{2}}\ \text{Sin}(\omega)$$

$$\omega = \frac{\pi}{4} - \Theta$$

$$T_{avg}(\Theta) = \frac{\phi_{DC}}{\phi_{NC}}$$

$$A = \frac{\phi_D - T_{avg}\ \Theta\ \phi_N}{\sqrt{t_{avg}^{2}(\Theta) + 1}}$$

$$B = \frac{\phi_N - \phi_D}{\sqrt{2}}$$

$$\rho_w = 1.001735 - 0.00000456\ T_f - 0.000000890\ T_f^{2}$$

(water density corrected for temperature)

III. R_{WSP}, R_{WAX}, and R_{WAD}

1. R_{WSP}

For $R_{mf} > 0.1$ ohm-m at 75 F (23.9 C)

$$R_{mfe} = 0.85\ R_{mf}$$

$$R_{we} = \frac{R_{mfe}}{Ratio}$$

$$Ratio = 10\left(\frac{-SP}{60 + .133\ T_f}\right)$$

For $R_{we} < 0.12$

$$R_w = \frac{77\ R_{we} + 5}{146 - 337\ R_{we}}$$

2. R_{WAX}

$$R_{WAX} = \frac{R_t}{F_{xo}}$$

$$F_{xo} = \frac{R_{LL8}}{R_{mff}}$$

(R_{mff} is R_{mf} at formation temperature)

3. R_{WAD}

$$R_{WAD} = \frac{\phi_e}{\phi_t\left(\frac{F}{R_t} - \frac{\phi_t - \phi_e}{\phi_t}\ \frac{1}{R_{wcly}}\right)}$$

$$F = \frac{a}{\phi_t^{\ m}}$$

IV. ρ_{ma}[10]

$$\rho_{ma} = \frac{\rho_b - \phi_x \rho_{mc}}{1 - \phi_x}$$

$$\phi_x = \frac{\phi_{DA} \phi_N - \phi_D \phi_{NA}}{\phi_{DA} - \phi_{NA}}$$

$$\phi_{DA} = \frac{2.71 - 4}{2.71 - \rho_{mf}}$$

$$\phi_{NA} = 0.7 - 10^{-\left(5 \phi_N + 0.16\right)}$$

V. S_w

$$S_w = \frac{-\frac{VSH}{RSH} + \sqrt{\left(\frac{VSH}{RSH}\right)^2 + \frac{4 (\phi_e)^m}{(a)(R_{WSP})(R_t)(1-VSH)}}}{\frac{2, \phi_e^{\,m}}{(a)(R_{WSP})(1-VSH)}}$$

(Simandoux's equation)*

*P. Simandoux, "Mesures Dielectrigues en Milieu Poreux, Application a Mesure des Saturations en Eau, Etude du Comportement des Manifs Argileux," Revue de l'institut du Petrole, Supplementary Issue, 1963.

APPENDIX D

INDIVIDUAL WELL SUMMARIES

The following sections are included for the four wells analyzed in this report:

1. Drilling Report
2. SP-Gamma Ray Overlay
3. Computed Results

The drilling summaries are translations of original documents which were in Spanish. These translations were obtained from the Lawrence Berkeley Laboratory and are included here to show the sequence of events prior to and after the downhole geophysical surveys. No editing is done on these reports to preserve the common language used in field practices.

The SP-Gamma Ray Overlays are included to show the quality of the SP logs.

Specific input data used for cases studied are shown for each table representing the computed results. The description of the output is as follows:

SP = SP reading from digitization

GR = Gamma Ray reading from digitization

PHID = Density Porosity reading from digitization

PHIN = Neutron Porosity reading from digitization

R_t = Computed R_t from Dual-Induction Laterolog

VSH = Computed VSH from ϕ_D - ϕ_N Cross Plot

PHIE = Computed ϕ_e

PHIT = Computed ϕ_t

VSHGR = Computed VSH from Gamma Ray

R_{WSP} = Computed R_{wa} from SP log

PPMSP = Computed Salinity from R_{WSP}

R_{wax} = Computed R_{wa} from R_{xo} data

PPMAX = Computed Salinity from R_{WAX}

R_{WAD} = Computed R_{WAD}

PPMD = Computed Salinity from R_{WAD}

S_w = Computed S_w

R_{mf} = Optimum R_{mf} (This column and the last represent the two roots to the quadratic equations. The root which is less or equal to the R_{mf} data given at the log reading is used in computer runs. If R_{wf} = 99., it is a message from the computer indicating no roots to the equations exists.

DRILLING REPORT ON WELL M-14

LOCATION:

The calculation of the coordinates uses as origin the center of Unit Number 1 of the Cerro Prieto Geothermal Power Plant and are referred to the rehabilitation system for the irrigation district of the Department of Hydraulic Resources (DHR).

X = 16,951.64 m

Y = 1,631.10 m

Elevation of the ground = 11.80 m above sea level (DHR).

This well was drilled in two stages with equipment from the PERFESA Company.

First stage with equipment H-35, rotary table elevation 3.12 m above ground level.

Second stage with equipment H-40, rotary table elevation 3.30 m above ground level.

It is located approximately 155.0 m northwest of well M-15, 200 m north of well M-20 and 195.0 m southwest of well M-39.

FIRST STAGE (Without constructing a cellar)

DRILLING 50.8 cm (20"Ø) HOLE

On 13 November '73 at 6:00 hours drilling was started with a 38.10 cm (15"Ø) bit, eight 16.51 cm (6-1/2"Ø) drill collars and 11.43 cm (4-1/2"Ø) full hole (F.H.) drill pipe, drilled plastic, light gray, slightly sandy clay from 0.0 m to 186.33 m below ground level (B.G.L.) where the inclination was taken with a TOTCO recorder obtaining a reading of 0°15', continued drilling in the same formation down the 246.88 m B.G.L., took inclination with TOTCO recorder obtaining a reading of 0°05', resumed drilling down to 263.88 m B.G.L., pulled out and removed 38.10 cm (15"Ø) bit, inserted 50.8 cm x 38.1 cm (29" x 15") "Home Made" hole opener enlarged the hole from 0.0 m to 255.88 m B.G.L.

CEMENTING 40.64 cm (16"Ø) CASING

At 5:30 hours on 18 November '73.

Circulated, conditioned mud and hole, ran 40.64 cm (16"Ø) H-40 96.70 kg/m (65#/ft) founded thread short coupling (R.T.S.C.) USS brand with the casing shoe placed at 252.88 m B.G.L.

With personnel and pumping equipment from B.J., cemented casing described above the 43.9 tons of cement modified with diamix in the proportion 1:1 in the form of grout of density 1.65, the excess cement came out satisfactorily to the surface, ordered 18 hours of setting starting at 2:50 hours on 19 November '73. Afterwards cut off 16 inch casing provisionally at 0.71 m B.G.L., welded the 16" S-2000 well-head and installed blow-out preventer with blank and annular 4-1/2"Ø rams.

HYDRAULIC TEST

Inserted 38.10 cm (15"Ø) bit, eight 16-51 cm (6-1/2"Ø) drill collars and 11.43 cm (4-1/2"Ø) drill pipe to 240.58 m B.G.L. where top of cement was reached, closed annular rams for 11.43 cm (4-1/2"Ø) drill pipe; made hydraulic test of the 40.64 (16"Ø) casing and cementing, with 45.5 kg/cm^2 (650 psig) for 30 minutes, observed a decrease of 3.5 kg/cm^2, considered the test satisfactory.

DRILLING 38.10 cm (15"Ø) HOLE

At 21:30 hours on 21 November '73.

With 38.10 cm (15"Ø) bit, eight 16.51 cm (6-1/2"Ø) drilling collars and 11.43 cm (4-1/2"Ø) F.H. drill pipe inside the 40.64 cm (16"Ø) casing cement drilled through plug, retainer collar and float shoe. Continued drilling in plastic sandy clay, coffee-colored light semi-compact shale from 255.88 m B.G.L. to 456.88 m B.G.L. Starting from this depth an increase was observed in the content of quartzitic sand, plastic clay and coffee-colored shales until 513.14 m B.G.L. where the inclination was taken with TOTCO recorder obtaining a reading of 0°5', continued drilling in the same formation to 686.32 m below ground level where the inclination was taken with TOTCO recorder obtaining a reading 0°40', continued drilling with increments in the percentage of sandstone, plastic clay, quartzitic sand, carbonaceous material, and traces of lignite to 793.93 m B.G.L. where inclination was taken with TOTCO recorder obtaining a reading of 0°20', continued drilling in light gray sandstone, dark gray shale, to 808.90 m B.G.L., circulated, pulled out and removed 38.10 cm (15'Ø) bit. Assembled and inserted 26.98 cm (10-5/8"Ø) bit at 11:15 hours on 6 December '73 with the same continued drilling from 808.90 m B.G.L. through compact dark gray shale, poorly cemented whitish sandstone, quartzitic material to 994.58 m B.G.L., suspended drilling and took inclination with TOTCO recorder at 938.58 m B.G.L. obtaining a reading of 1°00', later on pulled out and removed 26.99 cm (10-5/8"Ø) bit; assembled and inserted 38.10 cm (15"Ø) bit enlarging the hole from 808.90 m B.G.L. to 944.88 m B.G.L. continuing the drilling from 944.58 m B.G.L. to 954.88 m B.G.L., recovered dark gray shale, cemented sandstone and quartzitic material.

GEOPHYSICAL LOGS

With personnel and equipment from the Schlumberger Co. obtained induction log from 256.71 to 957.34 m below rotary table (B.R.T.) (842-3142') and micro log from 256.10 to 957.32 m B.R.T. (840-3140'), temperature at the bottom 104.4°C.

CEMENTING 29.85 cm (11-3/4"Ø) CASING

Inserted 38.10 cm (15"Ø) bit, eight 16.51 cm (6-1/2"Ø) drill collars and 11.43 cm (41"Ø) F.H. drill pipe noting light resistance at 396.42 m B.G.L. and from 776.47 m B.G.L. to 786.18 m B.G.L., finished inserting it to 954.88 m B.G.L. where mud and hole were conditioned, at 5:00 hours on 14 December '73 made preparations and necessary connections, running 29.85 cm (11-3/4"Ø) N-80 Youngstown, buttress thread (B.T.) of 89.5 kg/m (60 lb/foot) and K-55, NKK, B.T. of 69.9 kg/m (47 lb/foot) casing, encountering heavy resistance at the following depths: 289.69, 373.73, 385.74, and 397.73 m B.G.L., circulated and worked on the casing pipe. Later on continued running again detecting strong resistance at 440.77 to 445.77 m B.G.L. with maximum tensions of 68.2 tons (150,000 lb), upon observing signs of sticking decided at 17:15 hours on 14 December '73 to pull out the casing pipe, operation which was completed at 12:30 hours on 15 December '73 observed loss of retaining ring and centralizer of the last section, which remained inside the well. Assembled fishing tool ("Home Made" spear) followed by 11.43 cm (4-1/2"Ø) drill pipe, lowered to 472.90 m B.G.L. where resistance was encountered, operated and removed fishing tool with two parts of the centralizer (20%]. Inserted 38.10 cm (15"Ø) bit, eight 16.51 cm (6-1/2"Ø) drilling collars and 11.43 cm (4-1/2"Ø) F.H. drill pipe to 496.16 m B.G.L. where resistance was observed, starting from this depth inserted pipe by pipe to 954.88 m B.G.L. brought out bit at the shoe (16"Ø) casing inserting it again to 954.88 m B.G.L. where mud and hole were conditioned.

CEMENTING 29.84 cm (11-3/4"Ø) CASING

At 17:15 hours on 18 December '73 carried out preparations and necessary connections to run 29.84 cm (11-3/4"Ø) N-80 Youngstown B.T. 89.5 kg/m (60 lb/foot) and K-55 NKK, B.T. 69.9 kg/m (47 lb/foot) casing, strong resistance was observed at 440.77 and 447.77 m B.G.L., worked 52.3 tons (115,000 lb), circulated, continued to try to insert the casing working it down to 452.60 m B.G.L. observing maximum tension of 59.1 tons (130,000 lb), circulated and worked the casing down to 455.50 m B.G.L. observing a maximum tension of 68.2 tons (150,000 lb), worked the casing until tension decreased to 45.5 tons (100,000 lb); circulated and worked the casing to 460.61 m B.G.L. observing maximum tension of 63.6 tons (140,000 lb) and decided therefore to recover the casing starting at 8:15 hours on 19 December '74, an operation which was completed at 11:00 hours on 20 December '74, conditioned mud in pits, assembled 38.10 cm (15"Ø) bit, eight 16.51 cm (6-1/2"Ø) drill collars, 11.43 cm (4-1/2"Ø) F.H. drill pipe and inserted (pipe by pipe).

Without noticing resistance, little recovery of clay until 446.70 m B.G.L., took inclination with TOTCO recorder with a reading of 0°58', continued going through again to 463.58 m B.G.L., took inclination with TOTCO equipment with a reading of 1°, continued going over again to 860.18 m B.G.L. without observing neither resistance nor high contents of clay in the discharge. Pulled out to the surface and inserted the same drilling column again to 859.88 m B.G.L. where resistance was noted, inserted pipe by pipe to 954.88 m B.G.L., circulated at that point, pulled out drilling column to the surface, connected a section of drill pipe to the kelly and closed the annular rams of the preventer. Operations suspended at 12:00 hours on 24 December '74 for Christmas.

ENLARGING HOLE TO 44.45 cm (17-1/2"Ø)

On 27 December '74.

Installed 44.45 cm (17-1/2") model 10-KWA baker hole opener with 38.10 cm (15"Ø) pilot bit, eight 16.51 cm (6-1/2"Ø) drill collars and 11.43 cm (4-1/2"Ø) drill pipe inserted to 342.84 m B.G.L. where resistance was encountered, circulated, prepared and conditioned mud, operated the hole opener from 345.84 to 662.28 m B.G.L., recovered 100% clay, circulated and pulled out drilling column to the surface. Assembled 38.10 cm (15"Ø) bit, eight 16.51 cm (16-1/2"Ø) drill collars and 11.43 cm (4-1/2"Ø) drill pipe, inserted it to 661.88 m B.G.L. where light resistance was noted, circulated and inserted drilling column, circulating for intervals down to 954.88 m B.G.L., circulated and pulled out column to the surface.

At 2:00 hours on 30 December '73 started running 29.84 cm (11-3/4"Ø) N-80 Youngstown B.T. 89.5 kg/m (60 lb/foot) and K-55, NKK, B.T. 69.9 kg/m (47 lb/foot) casing 694.12 m B.G.L. where resistance was observed, worked in the casing, circulated and lowered to 699.70 m B.G.L. where strong resistance was observed, circulated, worked the casing with tensions of 63.6 tons, (140,000 lb) without achieving positive results, in one 0.35 casing run tensions increased to 68.2 tons (150,000 lb), decided to cement at this depth with 74.03 tons of cement type "G" modified 1:1 and 1:2 with diamix (80.15 m^3 of cement grout). The excess cement came out to the surface, the operation was terminated at 15:20 hours on 30 December '73, and 18 hours were waited before pulling out the 29.85 cm (11-3/4"Ø) casing, excavated cellar, cleaned the settling pit at 12:00 hours on 31 December, suspended operations for the end of the year. On 2 January '74 cut 11-3/4"Ø casing provisionally at the height of the preventer, inserted 26.99 cm (10-5/8"Ø) bit to 680.90 m B.G.L. where top of cement was loaded with 3 tons weight, pulled out drilling column, removed fifth preventer, welded flange with 2" opening to 11-3/4"Ø casing, inspected top of cement in 11-3/4", 16" annular space finding it at 4.83 m B.G.L., removed the 2" line connected to the flange which covers the 11-3/4"Ø casing considering the operations of the first stage terminated on 4 Jaunary '74. Disassembled H-35 equipment and transported it to the M-14 location. With personnel from the Mexico shop welded 29.85 x 30.48 cm (11-3/4 x 12") S-900, 3000 lb A.P.I. wellhead.

SECOND STAGE

HYDRAULIC TEST

On 4 February '74 the H-40 equipment was installed, assembled 26.98 cm (10-5/8"Ø) bit, four 20.32 cm (8"Ø) drill collars, six 16.51 cm (6-1/2"Ø) drill collars and 11.43 cm (4-1/2"Ø) F.H. drill pipe, lowered it to 674.67 m B.G.L. where it reached cement plug inside the 29.84 cm (11-3/4"Ø) casing.

Tried hydraulic test on three occasions without luck due to leaks between the well head (11-3/4" x 12") and adapter spool as well as between the preventer rams, removed drilling column to the surface, tightened the well head preventer (11-3/4" x 12") and the spool (12" x 16"), inserted open 11.43 cm (4-1/2"Ø) F.H. drill pipe to 14.70 cm B.G.L., operated the preventer rams, increased pressure to 31.68 kg/cm^2 (450 psig), observed pressure loss, tightened the preventer rams again.

Increased pressure to 28.16 kg/cm^2 (400 psig) for 15 minutes without observing any pressure loss, opened preventer, pulled out open drill pipe, installed surface connections, inserted 26.98 cm (10-5/8"Ø) bit, four 20.32 cm (8"Ø) drill collars, four 16.51 cm (6-1/2"Ø) drill collars and 11.43 cm (4-1/2"Ø) F.H. drill pipe, to 674.67 m B.G.L. (top of cement). On two occasions tried to carry out a test of the cementing job with negative results, tightened the connections, again carried out hydraulic test for 30 minutes with 56.32 kg/cm^2 (800 psig) satisfactorily.

DRILLING 26.99 cm (10-5/8"Ø) HOLE

At 18:45 hours on 8 February '74 with 26.98 cm (10-5/8"Ø) bit, four 20.32 cm (8"Ø) drill collars, four 16.51 cm (6-1/2"Ø) drill collars and 11.43 cm (4-1/2"Ø) drilling pipe, inside 29.84 cm (11-3/4"Ø) casing drilled through cement plug, "Baker" flapper valve float collar and "Baker" flapper valve float shoe from 674.67 m to 699.70 m B.G.L. cleaned and conditioned 38.10 cm (15"Ø) to 954.88 m B.G.L. where the bottom of the original hole was reached.

Resumed drilling through a formation of light gray, semi-compact coffee-colored shales, whitish sandstone and quartzitic material to 1062.20 m B.G.L. took inclination with TOTCO recorder, obtained a reading of 0°20' at 1059.20 m B.G.L., continued drilling through the same formation to 1101.70 m B.G.L. where a loss of mud was observed in the 4.0 m^3 pits, conditioned and increased the level of mud in pits with 35 sacks of bentonite, 1 sack of soda, 1 sack of milcon, 1 sack of unical, continued to drill to 1157.70 m B.G.L. with partial loss of mud (2 m^3) while adding sealing material to the mud, continued drilling in, semi-compact, dark slatty shale, and whitish sandstone, to 1173.70 m B.G.L., took inclination with TOTCO recorder obtaining a reading of 0°50'.

Continued drilling in the same formation, pulled out the drilling column because of the slow penetration rate. Assembled and inserted 26.98 cm (10-5/8"Ø) bit, four 20.32 cm (8"Ø) drill collars, two 16.51 cm (6-1/2"Ø) drill collars and 11.43 cm (4-1/2"Ø) drill pipe, drilling through dark gray shale, whitish sandstone to 1296.70 m B.G.L. took inclination with TOTCO recorder obtaining a reading of 2°30' at 1290.70 m B.G.L., verified this reading by running the instrument again.

With the same drilling column circulated at 1296.70 m B.G.L. to eliminate sealing material. Pulled the tool out to the surface and once more inserted 26.98 cm (10-5/8"Ø) bit, two 16.51 cm (6-1/2"Ø) drill collars and 11.43 cm (4-1/2"Ø) drill pipe flushing and conditioning the mud at intervals to the bottom (1296.70 m B.G.L.). Pulled drilling column out to the surface.

TEMPERATURE RECORDINGS

At 18:15 hours on 18 February '74.

With personnel and mechanical equipment from C.F.E. ran three temperature logs (two from the surface to 1296.70 m B.G.L., one from 996.70 to 1297.70 m B.G.L.).

Inserted 26.98 (10-5/8"Ø) bit, two 16.51 cm (6-1/2"Ø) drill collars and 11.43 cm (4-1/2"Ø) F.H. drill pipe down to the shoe of the 29.84 cm (11-3/4"Ø) casing (600.70 m B.G.L.) where circulation was done at low pressure, lowered column to the bottom circulating at low pressure at intervals because of break-down of the Schlumberger unit in El Centro, California, raised column to the shoe. Waited for news about the equipment mentioned till 17:30 hours on 19 February '74, confirmed arrival of the Schlumberger equipment, inserted bit down to the bottom, refrigerated with 50 blocks of ice, refrigerated the bend in the suction pit, pumped 35 m^3 of mud at 10°C into the well, pulled out drilling column to the surface.

GEOPHYSICAL LOGS

With personnel and equipment from Schlumberger obtained dual induction log from 954.27 to 1299.70 m B.R.T. (3130-4263'), compensated neutron density log from 954.27 to 1301.22 m B.R.T. (3130-4268'), and compensated gamma density log from 957.93 to 1301.22 m B.R.T. (1342-4268').

CEMENTING 19.36 cm (7-5/8"Ø) CASING

Inserted 26.98 cm (10-5/8"Ø) bit, two 16.51 cm (6-1/2"Ø) drill collars and 11.43 cm (4-1/2"Ø) drill pipe to 1296.70 m B.G.L. where mud and hole were conditioned.

At 17:30 hours on 20 February '74 carried out preparations and started to run 19.36 cm (7-5/8"Ø) K-55 39.29 kg/m (26.4 lb/foot) casing, slotted and blank equipped with buttress threads, one Model J cement collar, one flapper valve collar, one perforated Baker flapper value collar, one blank Baker collar, one

Davis guide shoe, four large metal baskets and 39 centralizers distributed in an alternative manner in the collars, the blank casing reached 1098.80 m B.G.L. and the end of the slotted casing 1293.20 m B.G.L.

With personnel and mechanical equipment from B.J. the casing was cemented in two stages. At 4:45 hours on 21 February '74 cemented the first stage with 3.74 m^3 of cement grout (3.83 tons, 1:1), at 11:25 hours cemented the second stage with 61.07 m^3 of cement grout (55.45 tons of cement 1:2) observing excess cement reaching the surface, waited 18:00 hours for setting, placed 30.48 x 20.48 cm (12" x 1-1/2") centralizers, but 19.36 cm (7-5/8"Ø) casing 0.15 m above the 11-3/4"Ø casing, installed preventer and surface connections.

HYDRAULIC TEST

Inserted 16.51 cm (6-1/2"Ø) bit and 11.43 cm (4-1/2"Ø) drill pipe at 983.64 m B.G.L., where it reached top of cement, operated annular rams on the blowout preventer, with 56 kg/cm^2 (800 psig), satisfactorily tested the casing and surface connections for 30 minutes with 68.25 kg/cm^2 (975 psig), the pressure increase was caused by the well heating up. Drilled through cement plug, "J" collar and float collar to 1085.04 m B.G.L. where circulation and hydraulic test were carried out with 56 kg/cm^2 (800 psig) for 30 minutes increasing to 70.4 kg/cm^2 (1000 psig), continued drilling through cement plug, perforated collar, and blank collar, continued lowering tool flushing at intervals without encountering resistance to 1291.70 m B.G.L., cleaned well, pulled out and disassembled drilling column. Installed 30.48 x 3032 cm (12" x 8") S-3000 expansion spool, 2032 cm (8"Ø) S-900 master valve, hydraulic preventer and inserted 7.30 cm (2-7/8"Ø). Internal Flush (I.F.), drill pipe circulating by stages, displaced mud by water to 1291.70 m B.G.L. observing that the water came out clean, pulled out breaking the 2-7/8"Ø I.F. drill pipe, satisfactorily tested 8"Ø master valve with 42 kg/cm^2 (600 psig) for 15 minutes at 14:45 hours on 2 March, closed master valve considering the well completed.

Compiled

(signed)

Julio Francisco Martinez R.

Reviewed

(signed)

Engineer Rene de Leon Botello
SUPERINTENDENT OF WELL DRILLING

Approved

(signed)

Engineer Bernardo Dominguez A.
GENERAL SUPERINTENDENT

SP-GAMMA RAY OVERLAYS WELL 14

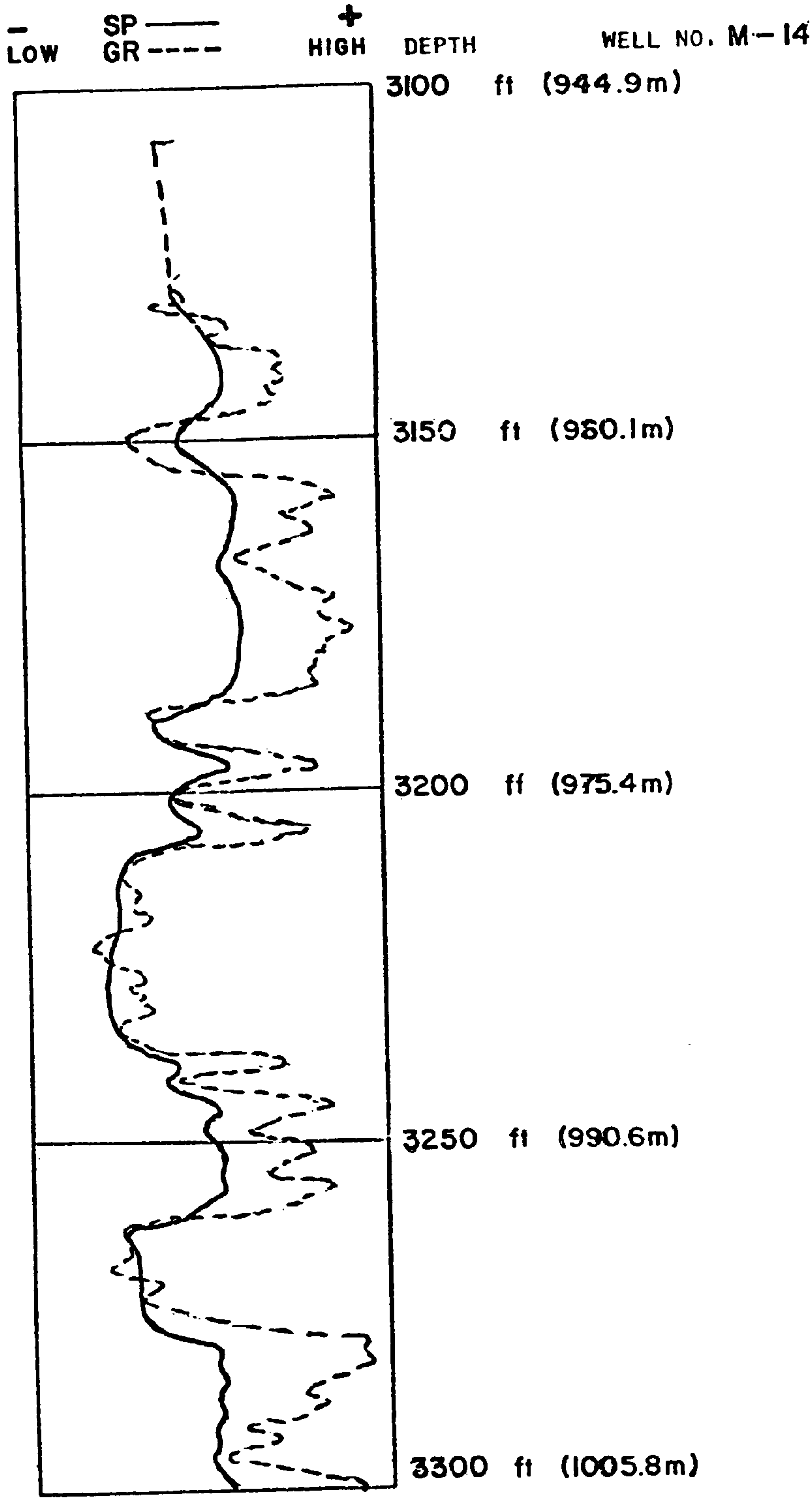

Fig. D-1. SP-Gamma Ray Overlay.

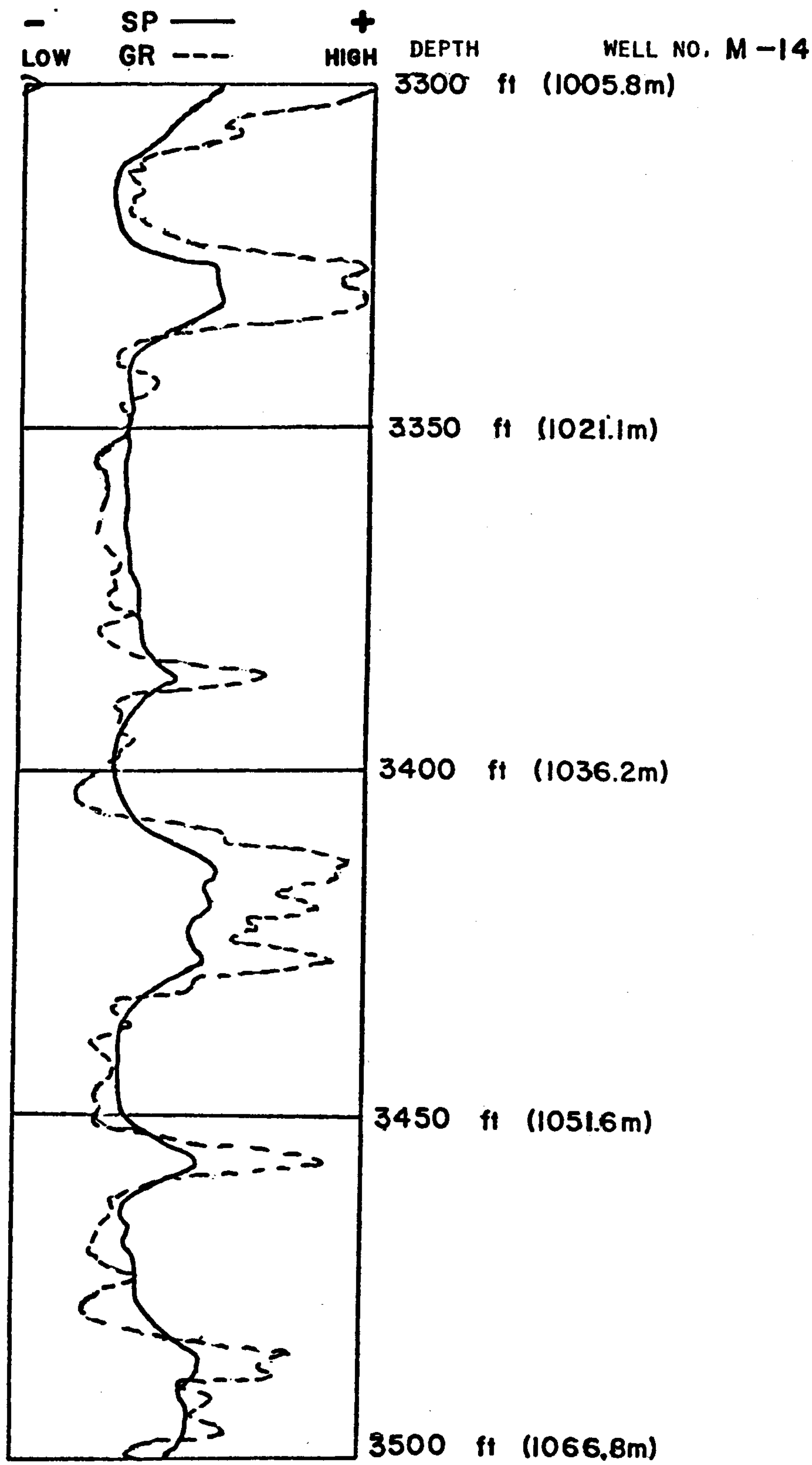

Fig. D-2. SP-Gamma Ray Overlay.

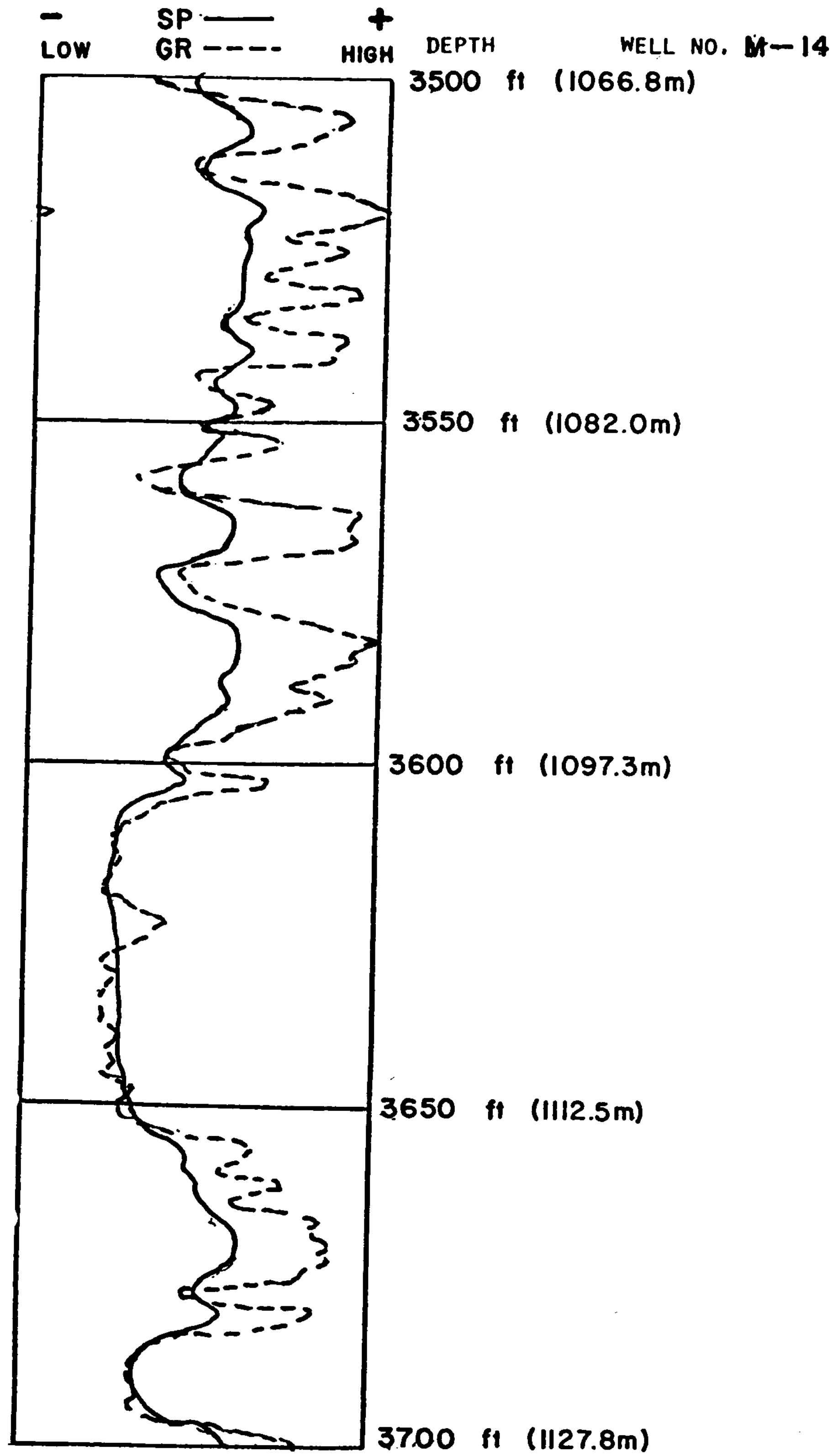

Fig. D-3. SP-Gamma Ray Overlay.

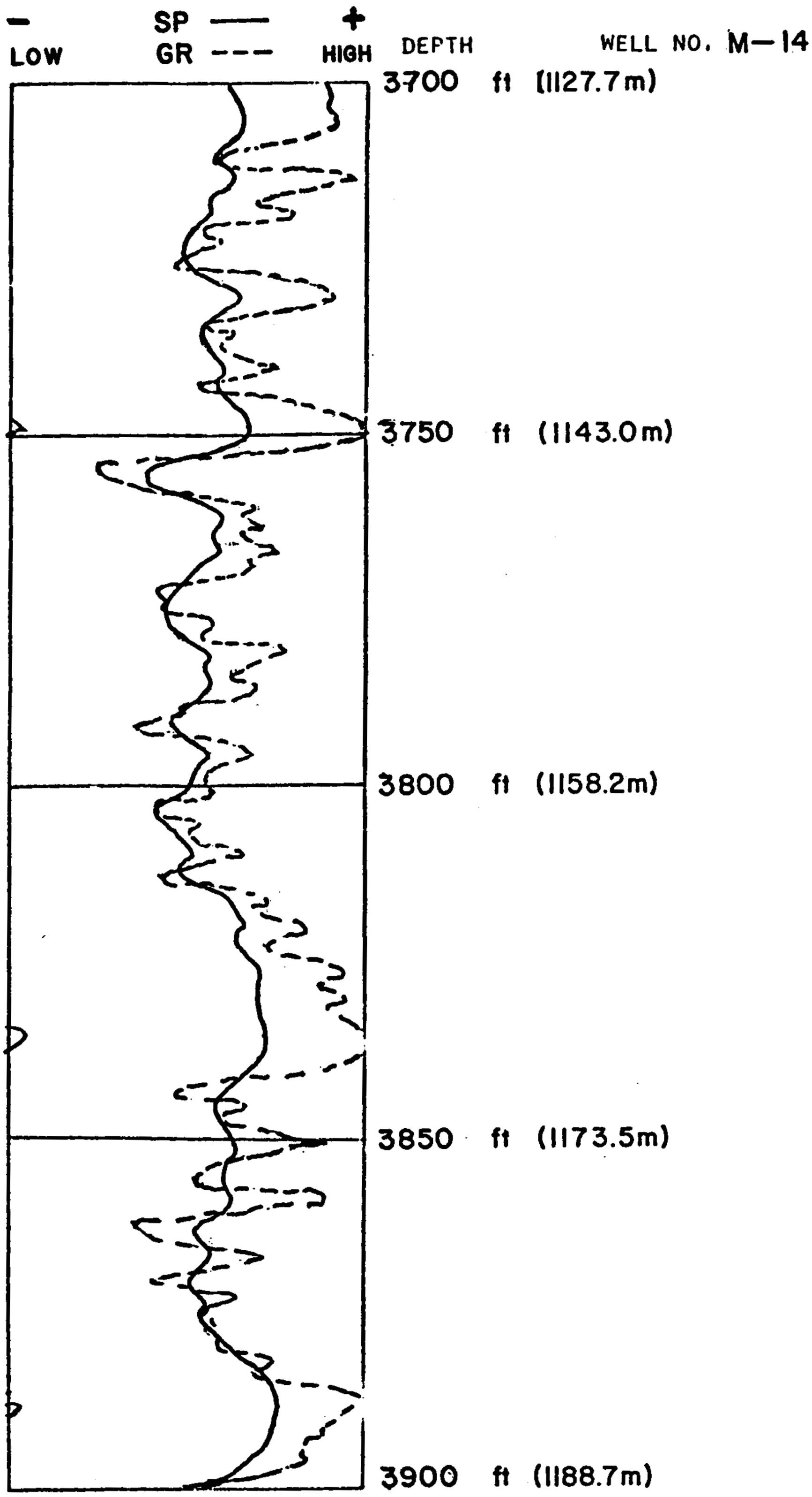

Fig. D-4. SP-Gamma Ray Overlay.

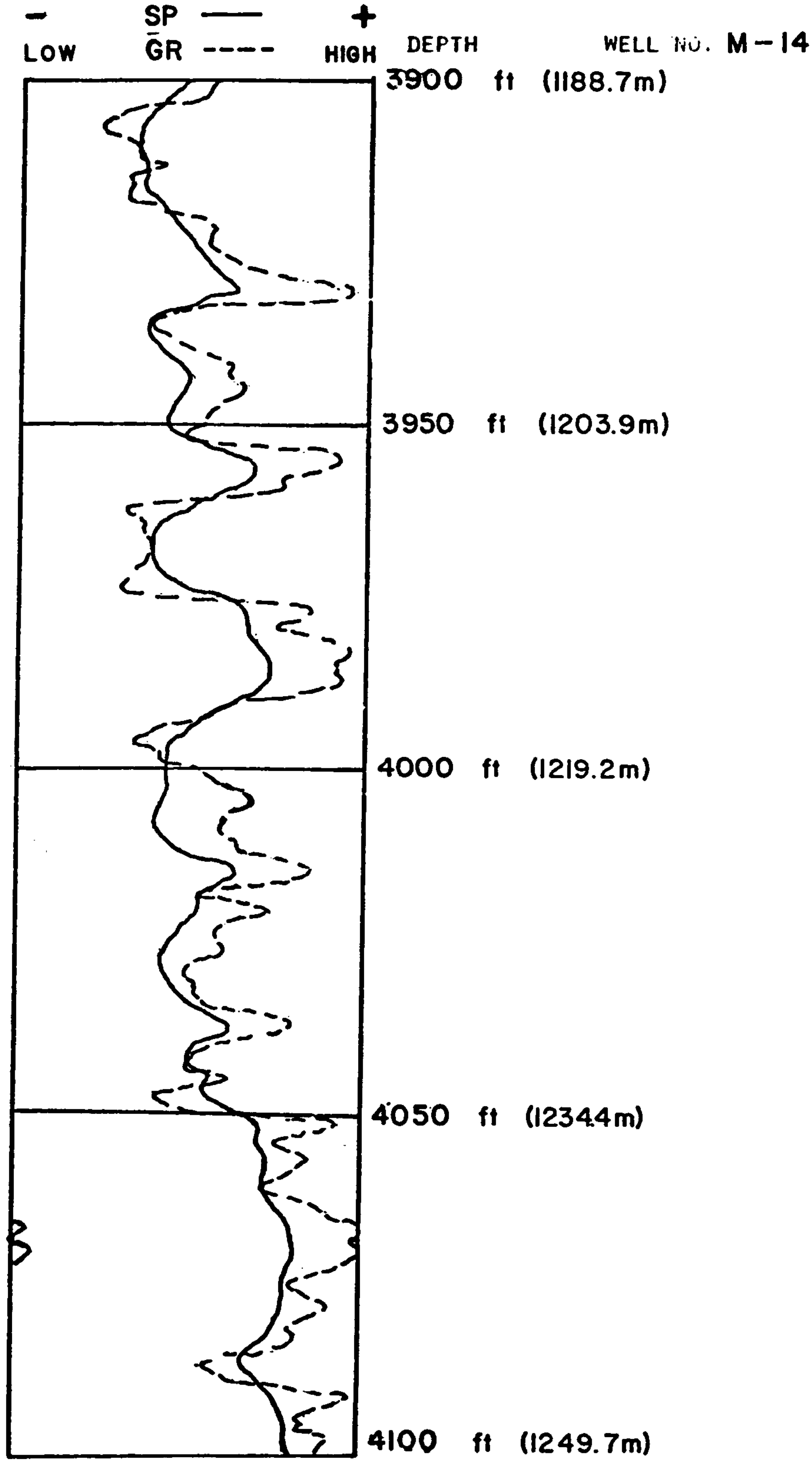

Fig. D-5. SP-Gamma Ray Overlay.

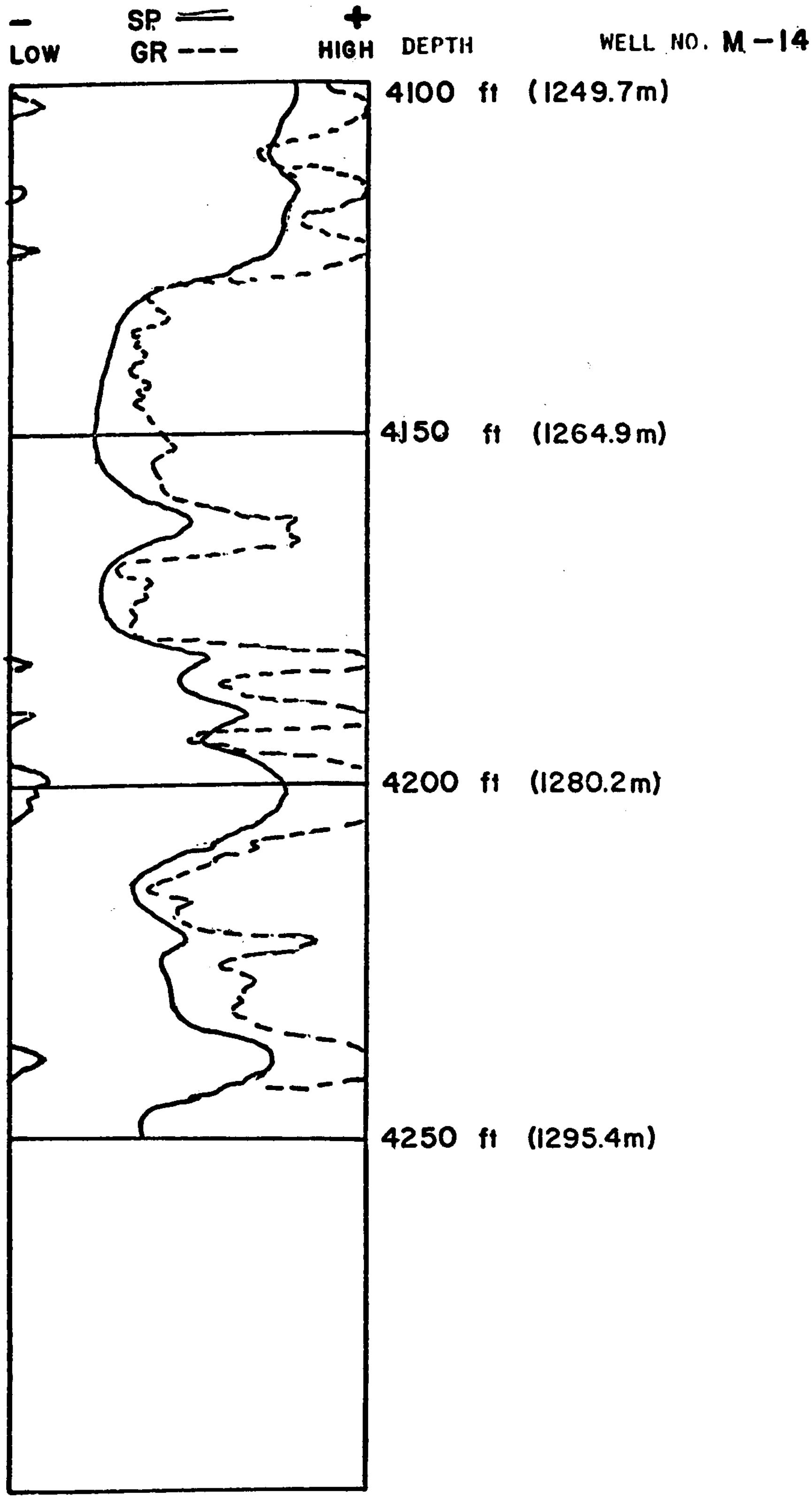

Fig. D-6. SP-Gamma Ray Overlay.

WELL NUMBER = 14
FIELD : CERRO PRIETO
RANGE : FROM 3338 TO 3384 TABLE 14-1′
COMPUTED DATA IS AS BELOW: Rmf= 1.340
Tmf= 71.000
RHOmf= 1.100
PHIDC= 0.01
PHINC= 0.21
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 225.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3338	-68.	81.	0.26	0.19	1.4	0.00	0.26	0.26	0.579	0.08	26596.	0.18	10938.	0.07	33370.	1.11	0.11	2.24
3340	-72.	77.	0.23	0.18	1.6	0.00	0.23	0.23	0.368	0.08	28707.	0.23	8674.	0.06	40746.	1.17	0.08	2.69
3342	-74.	85.	0.24	0.20	1.3	0.00	0.24	0.24	0.789	0.07	29769.	0.23	8666.	0.05	48035.	1.24	0.08	2.86
3344	-74.	89.	0.31	0.20	0.8	0.00	0.32	0.32	1.000	0.07	29769.	0.22	9172.	0.05	42355.	1.17	0.08	2.83
3346	-74.	80.	0.30	0.20	0.9	0.00	0.31	0.31	0.526	0.07	29769.	0.33	5864.	0.06	40348.	1.14	0.05	3.03
3348	-74.	79.	0.33	0.20	0.8	0.00	0.34	0.34	0.474	0.07	29657.	0.34	5691.	0.06	36610.	1.10	0.05	3.03
3350	-77.	81.	0.31	0.20	0.8	0.00	0.32	0.32	0.579	0.07	31241.	0.39	4930.	0.06	40557.	1.12	0.04	3.34
3352	-75.	78.	0.32	0.20	0.7	0.00	0.33	0.33	0.421	0.07	30185.	0.35	5495.	0.05	42035.	1.16	0.05	3.13
3354	-75.	72.	0.32	0.20	0.7	0.00	0.33	0.33	0.105	0.07	30185.	0.31	6203.	0.05	41834.	1.16	0.06	3.08
3356	-77.	73.	0.31	0.21	0.7	0.00	0.32	0.32	0.158	0.07	31120.	0.32	5914.	0.05	50801.	1.24	0.05	3.27
3358	-75.	75.	0.31	0.21	0.7	0.00	0.32	0.32	0.263	0.07	30070.	0.28	7058.	0.05	48286.	1.23	0.06	3.02
3360	-75.	75.	0.33	0.23	1.0	0.00	0.34	0.34	0.263	0.07	30070.	0.34	5695.	0.08	27762.	0.96	0.05	3.10
3362	-75.	73.	0.33	0.23	0.9	0.00	0.34	0.34	0.158	0.07	30070.	0.29	6648.	0.07	29929.	1.00	0.06	3.05
3364	-75.	73.	0.28	0.21	-2.1	0.00	0.28	0.28	0.158	0.07	30070.	-0.65	2855.	-0.12	17932.	0.79	3.64	-0.02
3366	-75.	70.	0.29	0.21	1.7	0.00	0.29	0.29	0.000	0.07	29957.	0.43	4345.	0.10	21438.	0.86	0.04	3.18
3368	-74.	74.	0.25	0.20	1.0	0.00	0.25	0.25	0.211	0.07	29436.	0.22	8970.	0.04	52940.	1.30	0.08	2.82
3370	-74.	78.	0.26	0.20	0.9	0.00	0.26	0.26	0.421	0.07	29436.	0.18	10917.	0.04	57582.	1.35	0.10	2.70
3372	-72.	78.	0.27	0.20	1.0	0.00	0.27	0.27	0.421	0.08	28394.	0.22	8970.	0.05	42986.	1.20	0.08	2.65
3374	-71.	78.	0.26	0.20	0.8	0.00	0.26	0.26	0.421	0.08	27875.	0.19	10648.	0.04	61871.	1.42	0.10	2.47
3376	-72.	78.	0.27	0.20	0.5	0.00	0.27	0.27	0.421	0.08	28291.	0.13	15629.	0.03	96881.	1.72	0.16	2.25
3378	-69.	80.	0.24	0.21	8.5	0.00	0.24	0.24	0.526	0.08	26745.	1.98	908.	0.32	5908.	0.50	0.01	2.89
3380	-69.	73.	0.25	0.20	0.6	0.00	0.25	0.25	0.158	0.08	26745.	0.14	14965.	0.03	100101.	1.79	0.16	2.05
3382	-69.	78.	0.26	0.20	0.9	0.00	0.26	0.26	0.421	0.08	26745.	0.20	9942.	0.04	54004.	1.37	0.10	2.35
3384	-63.	86.	0.23	0.21	1.3	0.00	0.23	0.23	0.842	0.09	23694.	0.23	8666.	0.04	53197.	1.43	0.09	2.00

WELL NUMBER = 14
FIELD : CERRO PRIETO
RANGE : FROM 3334 TO 3384

TABLE 14-2'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 1.340
Tmf= 71.000
RHOmf= 1.100
PHIDC= 0.01
PHINC= 0.21
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 500.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3334	-41.	134.	0.10	0.24	0.7	0.70	0.09	0.16	1.000	0.10	9477.	0.12	7264.	0.01	204775.	1.84	0.10	0.59
3336	-54.	100.	0.19	0.21	1.0	0.10	0.19	0.20	0.469	0.08	11451.	0.11	7981.	0.02	47998.	1.76	0.10	0.85
3338	-68.	81.	0.26	0.19	1.4	0.00	0.26	0.26	0.172	0.07	13622.	0.08	10938.	0.07	14037.	1.01	0.14	1.06
3340	-72.	77.	0.23	0.18	1.6	0.00	0.23	0.23	0.109	0.07	14240.	0.10	8674.	0.06	17053.	1.09	0.09	1.35
3342	-74.	85.	0.24	0.20	1.3	0.00	0.24	0.24	0.234	0.07	14548.	0.10	8666.	0.05	20021.	1.16	0.09	1.42
3344	-74.	89.	0.31	0.20	0.8	0.00	0.32	0.32	0.297	0.07	14548.	0.10	9172.	0.05	17709.	1.09	0.10	1.39
3346	-74.	80.	0.30	0.20	0.9	0.00	0.31	0.31	0.156	0.07	14548.	0.15	5864.	0.06	16891.	1.07	0.06	1.59
3348	-74.	79.	0.33	0.20	0.8	0.00	0.34	0.34	0.141	0.07	14548.	0.16	5691.	0.06	15436.	1.03	0.06	1.60
3350	-77.	81.	0.31	0.20	0.8	0.00	0.32	0.32	0.172	0.06	15007.	0.18	4930.	0.06	17057.	1.06	0.05	1.76
3352	-75.	78.	0.32	0.20	0.7	0.00	0.33	0.33	0.125	0.06	14701.	0.16	5495.	0.05	17662.	1.09	0.05	1.65
3354	-75.	72.	0.32	0.20	0.7	0.00	0.33	0.33	0.031	0.06	14701.	0.14	6203.	0.05	17580.	1.08	0.06	1.61
3356	-77.	73.	0.31	0.21	0.7	0.00	0.32	0.32	0.047	0.06	15007.	0.15	5914.	0.05	21345.	1.17	0.06	1.70
3358	-75.	75.	0.31	0.21	0.7	0.00	0.32	0.32	0.078	0.06	14701.	0.13	7058.	0.05	20315.	1.16	0.07	1.55
3360	-75.	75.	0.33	0.23	1.0	0.00	0.34	0.34	0.078	0.06	14701.	0.16	5695.	0.08	11843.	0.91	0.06	1.64
3362	-75.	73.	0.33	0.23	0.9	0.00	0.34	0.34	0.047	0.06	14701.	0.13	6648.	0.07	12743.	0.94	0.07	1.58
3364	-75.	73.	0.28	0.21	-2.1	0.00	0.28	0.28	0.047	0.06	14701.	-0.30	2855.	-0.12	7735.	0.74	2.17	-0.02
3366	-75.	70.	0.29	0.21	1.7	0.00	0.29	0.29	0.000	0.06	14701.	0.20	4345.	0.10	9248.	0.81	0.04	1.72
3368	-74.	74.	0.25	0.20	1.0	0.00	0.25	0.25	0.063	0.07	14548.	0.10	8970.	0.04	22327.	1.21	0.10	1.40
3370	-74.	78.	0.26	0.20	0.9	0.00	0.26	0.26	0.125	0.07	14548.	0.08	10917.	0.04	24234.	1.26	0.13	1.28
3372	-72.	78.	0.27	0.20	1.0	0.00	0.27	0.27	0.125	0.07	14240.	0.10	8970.	0.05	18223.	1.12	0.10	1.33
3374	-71.	78.	0.26	0.20	0.8	0.00	0.26	0.26	0.125	0.07	14086.	0.09	10648.	0.04	25994.	1.32	0.13	1.19
3376	-72.	78.	0.27	0.20	0.5	0.00	0.27	0.27	0.125	0.07	14240.	0.06	15629.	0.03	40454.	1.60	0.25	0.87
3378	-69.	80.	0.24	0.21	8.5	0.00	0.24	0.24	0.156	0.07	13776.	0.92	908.	0.32	2646.	0.46	0.01	1.73
3380	-69.	73.	0.25	0.20	0.6	0.00	0.25	0.25	0.047	0.07	13776.	0.06	14965.	0.03	41765.	1.65	0.25	0.80
3382	-69.	78.	0.26	0.20	0.9	0.00	0.26	0.26	0.125	0.07	13776.	0.09	9942.	0.04	22872.	1.26	0.12	1.16
3384	-63.	86.	0.23	0.21	1.3	0.00	0.23	0.23	0.250	0.07	12846.	0.10	8666.	0.04	22538.	1.29	0.10	1.05

WELL NUMBER = 14
FIELD : CERRO PRIETO
RANGE : FROM 3338 TO 3384

TABLE 14-3′
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.370
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.01
PHINC= 0.21
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 500.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3338	-68.	81.	0.26	0.19	1.4	0.00	0.26	0.26	0.579	0.04	22691.	0.02	43050.	0.07	14037.	0.80	0.14	1.06
3340	-72.	77.	0.23	0.18	1.6	0.00	0.23	0.23	0.368	0.04	23086.	0.03	33811.	0.06	17053.	0.87	0.09	1.35
3342	-74.	85.	0.24	0.20	1.3	0.00	0.24	0.24	0.789	0.04	23277.	0.03	33779.	0.05	20021.	0.93	0.09	1.42
3344	-74.	89.	0.31	0.20	0.8	0.00	0.32	0.32	1.000	0.04	23277.	0.03	35832.	0.05	17709.	0.88	0.10	1.39
3346	-74.	80.	0.30	0.20	0.9	0.00	0.31	0.31	0.526	0.04	23277.	0.04	22482.	0.06	16891.	0.86	0.06	1.59
3348	-74.	79.	0.33	0.20	0.8	0.00	0.34	0.34	0.474	0.04	23277.	0.05	21794.	0.06	15436.	0.83	0.06	1.60
3350	-77.	81.	0.31	0.20	0.8	0.00	0.32	0.32	0.579	0.04	23555.	0.05	18764.	0.06	17057.	0.86	0.05	1.76
3352	-75.	78.	0.32	0.20	0.7	0.00	0.33	0.33	0.421	0.04	23371.	0.05	21012.	0.05	17662.	0.88	0.05	1.65
3354	-75.	72.	0.32	0.20	0.7	0.00	0.33	0.33	0.105	0.04	23371.	0.04	23842.	0.05	17580.	0.88	0.06	1.61
3356	-77.	73.	0.31	0.21	0.7	0.00	0.32	0.32	0.158	0.04	23555.	0.04	22682.	0.05	21345.	0.96	0.06	1.70
3358	-75.	75.	0.31	0.21	0.7	0.00	0.32	0.32	0.263	0.04	23371.	0.04	27273.	0.05	20315.	0.94	0.07	1.55
3360	-75.	75.	0.33	0.23	1.0	0.00	0.34	0.34	0.263	0.04	23371.	0.05	21810.	0.08	11843.	0.73	0.06	1.64
3362	-75.	73.	0.33	0.23	0.9	0.00	0.34	0.34	0.158	0.04	23371.	0.04	25625.	0.07	12743.	0.76	0.07	1.58
3364	-75.	73.	0.28	0.21	-2.1	0.00	0.28	0.28	0.158	0.04	23371.	-0.09	10614.	-0.12	7735.	0.60	2.17	-0.02
3366	-75.	70.	0.29	0.21	1.7	0.00	0.29	0.29	0.000	0.04	23371.	0.06	16449.	0.10	9248.	0.65	0.04	1.72
3368	-74.	74.	0.25	0.20	1.0	0.00	0.25	0.25	0.211	0.04	23277.	0.03	35012.	0.04	22327.	0.98	0.10	1.40
3370	-74.	78.	0.26	0.20	0.9	0.00	0.26	0.26	0.421	0.04	23277.	0.02	42963.	0.04	24234.	1.02	0.13	1.28
3372	-72.	78.	0.27	0.20	1.0	0.00	0.27	0.27	0.421	0.04	23086.	0.03	35012.	0.05	18223.	0.90	0.10	1.33
3374	-71.	78.	0.26	0.20	0.8	0.00	0.26	0.26	0.421	0.04	22989.	0.03	41859.	0.04	25994.	1.06	0.13	1.19
3376	-72.	78.	0.27	0.20	0.5	0.00	0.27	0.27	0.421	0.04	23086.	0.02	62421.	0.03	40454.	1.28	0.25	0.87
3378	-69.	80.	0.24	0.21	8.5	0.00	0.24	0.24	0.526	0.04	22791.	0.27	3209.	0.32	2646.	0.37	0.01	1.73
3380	-69.	73.	0.25	0.20	0.6	0.00	0.25	0.25	0.158	0.04	22791.	0.02	59666.	0.03	41765.	1.31	0.25	0.80
3382	-69.	78.	0.26	0.20	0.9	0.00	0.26	0.26	0.421	0.04	22791.	0.03	38975.	0.04	22872.	1.00	0.12	1.16
3384	-63.	86.	0.23	0.21	1.3	0.00	0.23	0.23	0.842	0.04	22172.	0.03	33779.	0.04	22538.	1.01	0.10	1.05

WELL NUMBER = 14
FIELD : CERRO PRIETO
RANGE : FROM 3338 TO 3384

TABLE 14-4'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.334
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.01
PHINC= 0.21
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 450.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3338	-68.	81.	0.26	0.19	1.4	0.00	0.26	0.26	0.579	0.04	25877.	0.02	48338.	0.07	15728.	0.80	0.13	1.19
3340	-72.	77.	0.23	0.18	1.6	0.00	0.23	0.23	0.368	0.04	26327.	0.03	37935.	0.06	19120.	0.87	0.09	1.49
3342	-74.	85.	0.24	0.20	1.3	0.00	0.24	0.24	0.789	0.04	26544.	0.03	37898.	0.05	22459.	0.93	0.09	1.57
3344	-74.	89.	0.31	0.20	0.8	0.00	0.32	0.32	1.000	0.04	26544.	0.03	40210.	0.05	19858.	0.88	0.10	1.54
3346	-74.	80.	0.30	0.20	0.9	0.00	0.31	0.31	0.526	0.04	26544.	0.04	25190.	0.06	18937.	0.86	0.06	1.74
3348	-74.	79.	0.33	0.20	0.8	0.00	0.34	0.34	0.474	0.04	26544.	0.05	24416.	0.06	17301.	0.82	0.05	1.75
3350	-77.	81.	0.31	0.20	0.8	0.00	0.32	0.32	0.579	0.04	26859.	0.05	21011.	0.06	19124.	0.86	0.05	1.93
3352	-75.	78.	0.32	0.20	0.7	0.00	0.33	0.33	0.421	0.04	26650.	0.05	23538.	0.05	19805.	0.87	0.05	1.81
3354	-75.	72.	0.32	0.20	0.7	0.00	0.33	0.33	0.105	0.04	26650.	0.04	26718.	0.05	19713.	0.87	0.06	1.76
3356	-77.	73.	0.31	0.21	0.7	0.00	0.32	0.32	0.158	0.04	26859.	0.04	25414.	0.05	23951.	0.95	0.06	1.87
3358	-75.	75.	0.31	0.21	0.7	0.00	0.32	0.32	0.263	0.04	26650.	0.04	30577.	0.05	22790.	0.93	0.07	1.71
3360	-75.	75.	0.33	0.23	1.0	0.00	0.34	0.34	0.263	0.04	26650.	0.05	24434.	0.08	13261.	0.73	0.05	1.80
3362	-75.	73.	0.33	0.23	0.9	0.00	0.34	0.34	0.158	0.04	26650.	0.04	28724.	0.07	14273.	0.75	0.07	1.74
3364	-75.	73.	0.28	0.21	-2.1	0.00	0.28	0.28	0.158	0.04	26650.	-0.09	11862.	-0.12	8648.	0.60	2.33	-0.02
3366	-75.	70.	0.29	0.21	1.7	0.00	0.29	0.29	0.000	0.04	26650.	0.06	18411.	0.10	10346.	0.65	0.04	1.88
3368	-74.	74.	0.25	0.20	1.0	0.00	0.25	0.25	0.211	0.04	26544.	0.03	39286.	0.04	25056.	0.97	0.09	1.55
3370	-74.	78.	0.26	0.20	0.9	0.00	0.26	0.26	0.421	0.04	26544.	0.02	48241.	0.04	27204.	1.01	0.12	1.43
3372	-72.	78.	0.27	0.20	1.0	0.00	0.27	0.27	0.421	0.04	26327.	0.03	39286.	0.05	20436.	0.89	0.10	1.47
3374	-71.	78.	0.26	0.20	0.8	0.00	0.26	0.26	0.421	0.04	26217.	0.03	46997.	0.04	29186.	1.05	0.12	1.33
3376	-72.	78.	0.27	0.20	0.5	0.00	0.27	0.27	0.421	0.04	26327.	0.02	70176.	0.03	45490.	1.28	0.23	1.03
3378	-69.	80.	0.24	0.21	8.5	0.00	0.24	0.24	0.526	0.04	25992.	0.27	3572.	0.32	2947.	0.36	0.01	1.86
3380	-69.	73.	0.25	0.20	0.6	0.00	0.25	0.25	0.158	0.04	25992.	0.02	67068.	0.03	46970.	1.30	0.22	0.95
3382	-69.	78.	0.26	0.20	0.9	0.00	0.26	0.26	0.421	0.04	25992.	0.03	43749.	0.04	25670.	0.99	0.11	1.30
3384	-63.	86.	0.23	0.21	1.3	0.00	0.23	0.23	0.842	0.04	25284.	0.03	37898.	0.04	25294.	1.00	0.10	1.16

WELL NUMBER = 14
FIELD : CERRO PRIETO
RANGE : FROM 3606 TO 3652

TABLE 14-5'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 1.340
Tmf= 71.000
RHOmf= 1.100
PHIDC= 0.01
PHINC= 0.21
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 500.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3606	-72.	89.	0.23	0.17	1.5	0.00	0.23	0.23	0.941	0.07	14240.	0.10	8766.	0.05	18687.	1.13	0.10	1.34
3608	-77.	85.	0.24	0.17	1.5	0.00	0.24	0.24	0.706	0.06	15007.	0.09	10042.	0.06	16057.	1.03	0.11	1.45
3610	-83.	78.	0.27	0.17	1.1	0.00	0.28	0.28	0.294	0.06	15915.	0.13	6721.	0.06	16324.	1.01	0.06	1.89
3612	-83.	75.	0.26	0.17	0.9	0.00	0.26	0.26	0.118	0.06	15915.	0.17	5224.	0.04	22927.	1.18	0.05	1.98
3614	-84.	77.	0.28	0.16	0.9	0.00	0.29	0.29	0.235	0.06	16064.	0.16	5449.	0.05	19080.	1.08	0.05	2.01
3616	-86.	74.	0.20	0.15	1.2	0.00	0.20	0.20	0.059	0.06	16362.	0.14	6424.	0.03	32359.	1.36	0.06	2.04
3618	-86.	76.	0.18	0.14	1.9	0.00	0.18	0.18	0.176	0.06	16362.	0.13	6623.	0.04	26884.	1.25	0.06	2.03
3620	-86.	78.	0.20	0.15	1.6	0.00	0.20	0.20	0.294	0.06	16362.	0.07	13095.	0.04	24716.	1.21	0.15	1.63
3622	-86.	82.	0.27	0.15	1.2	0.00	0.28	0.28	0.529	0.06	16362.	0.21	4222.	0.06	16052.	0.99	0.04	2.17
3624	-86.	90.	0.25	0.16	0.9	0.00	0.25	0.25	1.000	0.06	16362.	0.16	5449.	0.04	25692.	1.23	0.05	2.10
3626	-82.	86.	0.28	0.17	1.1	0.00	0.29	0.29	0.765	0.06	15765.	0.11	8344.	0.06	16211.	1.01	0.08	1.75
3628	-81.	76.	0.32	0.17	0.9	0.00	0.33	0.33	0.176	0.06	15614.	0.21	4222.	0.07	13644.	0.94	0.04	1.96
3630	-81.	73.	0.35	0.17	0.7	0.00	0.36	0.36	0.000	0.06	15614.	0.16	5646.	0.06	15298.	0.99	0.05	1.87
3632	-81.	76.	0.33	0.17	0.6	0.00	0.34	0.34	0.176	0.06	15614.	0.14	6190.	0.05	18218.	1.07	0.06	1.84
3634	-80.	73.	0.32	0.17	0.7	0.00	0.33	0.33	0.000	0.06	15463.	0.15	5750.	0.05	17976.	1.07	0.05	1.83
3636	-80.	74.	0.33	0.17	0.6	0.00	0.34	0.34	0.059	0.06	15463.	0.13	7115.	0.05	21304.	1.16	0.07	1.74
3638	-80.	73.	0.30	0.15	0.7	0.00	0.31	0.31	0.000	0.06	15463.	0.14	6215.	0.05	20735.	1.14	0.06	1.80
3640	-80.	77.	0.31	0.15	0.7	0.00	0.32	0.32	0.235	0.06	15463.	0.17	5070.	0.05	19448.	1.11	0.05	1.87
3642	-80.	73.	0.31	0.16	0.7	0.00	0.32	0.32	0.000	0.06	15463.	0.15	5795.	0.05	19284.	1.11	0.06	1.82
3644	-80.	76.	0.30	0.16	0.7	0.00	0.31	0.31	0.176	0.06	15463.	0.16	5495.	0.05	20570.	1.14	0.05	1.84
3646	-79.	74.	0.33	0.17	0.7	0.00	0.34	0.34	0.059	0.06	15311.	0.10	8948.	0.06	17461.	1.06	0.09	1.59
3648	-79.	82.	0.27	0.16	0.9	0.00	0.28	0.28	0.529	0.06	15311.	0.18	4796.	0.05	21129.	1.16	0.04	1.84
3650	-80.	79.	0.27	0.17	9.1	0.00	0.28	0.28	0.353	0.06	15463.	-0.03	39692.	0.47	1806.	0.36	4.11	-0.14
3652	-74.	79.	0.26	0.17	0.9	0.00	0.26	0.26	0.353	0.07	14548.	0.16	5528.	0.04	24080.	1.26	0.05	1.61

WELL NUMBER = 14
FIELD : CERRO PRIETO
RANGE : FROM .3606 TO 3652

TABLE 14-6'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 1.340
Tmf= 71.000
RHOmf= 1.100
PHIDC= 0.01
PHINC= 0.21
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 450.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3606	-72.	89.	0.23	0.17	1.5	0.00	0.23	0.23	0.941	0.07	15659.	0.12	8766.	0.05	20958.	1.14	0.09	1.49
3608	-77.	85.	0.24	0.17	1.5	0.00	0.24	0.24	0.706	0.06	16572.	0.10	10042.	0.06	18000.	1.04	0.11	1.62
3610	-83.	78.	0.27	0.17	1.1	0.00	0.28	0.28	0.294	0.06	17654.	0.15	6721.	0.06	18300.	1.02	0.06	2.09
3612	-83.	75.	0.26	0.17	0.9	0.00	0.26	0.26	0.118	0.06	17654.	0.19	5224.	0.04	25731.	1.19	0.05	2.18
3614	-84.	77.	0.28	0.16	0.9	0.00	0.29	0.29	0.235	0.06	17832.	0.18	5449.	0.05	21401.	1.09	0.05	2.22
3616	-86.	74.	0.20	0.15	1.2	0.00	0.20	0.20	0.059	0.06	18187.	0.15	6424.	0.03	36360.	1.36	0.06	2.26
3618	-86.	76.	0.18	0.14	1.9	0.00	0.18	0.18	0.176	0.06	18187.	0.15	6623.	0.04	30189.	1.26	0.06	2.25
3620	-86.	78.	0.20	0.15	1.6	0.00	0.20	0.20	0.294	0.06	18187.	0.08	13095.	0.04	27747.	1.21	0.14	1.86
3622	-86.	82.	0.27	0.15	1.2	0.00	0.28	0.28	0.529	0.06	18187.	0.23	4222.	0.06	17993.	1.00	0.04	2.39
3624	-86.	90.	0.25	0.16	0.9	0.00	0.25	0.25	1.000	0.06	18187.	0.18	5449.	0.04	28846.	1.23	0.05	2.32
3626	-82.	86.	0.28	0.17	1.1	0.00	0.29	0.29	0.765	0.06	17475.	0.12	8344.	0.06	18173.	1.02	0.08	1.95
3628	-81.	76.	0.32	0.17	0.9	0.00	0.33	0.33	0.176	0.06	17295.	0.23	4222.	0.07	15286.	0.95	0.04	2.15
3630	-81.	73.	0.35	0.17	0.7	0.00	0.36	0.36	0.000	0.06	17295.	0.17	5646.	0.06	17146.	1.00	0.05	2.06
3632	-81.	76.	0.33	0.17	0.6	0.00	0.34	0.34	0.176	0.06	17295.	0.16	6190.	0.05	20431.	1.08	0.06	2.03
3634	-80.	73.	0.32	0.17	0.7	0.00	0.33	0.33	0.000	0.06	17115.	0.17	5750.	0.05	20158.	1.08	0.05	2.01
3636	-80.	74.	0.33	0.17	0.6	0.00	0.34	0.34	0.059	0.06	17115.	0.14	7115.	0.05	23904.	1.16	0.07	1.93
3638	-80.	73.	0.30	0.15	0.7	0.00	0.31	0.31	0.000	0.06	17115.	0.16	6215.	0.05	23264.	1.15	0.06	1.98
3640	-80.	77.	0.31	0.15	0.7	0.00	0.32	0.32	0.235	0.06	17115.	0.19	5070.	0.05	21815.	1.12	0.05	2.05
3642	-80.	73.	0.31	0.16	0.7	0.00	0.32	0.32	0.000	0.06	17115.	0.17	5795.	0.05	21631.	1.11	0.05	2.01
3644	-80.	76.	0.30	0.16	0.7	0.00	0.31	0.31	0.176	0.06	17115.	0.18	5495.	0.05	23078.	1.14	0.05	2.03
3646	-79.	74.	0.33	0.17	0.7	0.00	0.34	0.34	0.059	0.06	16935.	0.11	8948.	0.06	19579.	1.07	0.09	1.77
3648	-79.	82.	0.27	0.16	0.9	0.00	0.28	0.28	0.529	0.06	16935.	0.20	4796.	0.05	23707.	1.16	0.04	2.02
3650	-80.	79.	0.27	0.17	9.1	0.00	0.28	0.28	0.353	0.06	17115.	-0.03	39692.	0.47	2009.	0.37	4.30	-0.15
3652	-74.	79.	0.26	0.17	0.9	0.00	0.26	0.26	0.353	0.07	16025.	0.18	5528.	0.04	27031.	1.27	0.05	1.76

WELL NUMBER = 14
FIELD : CERRO PRIETO
RANGE : FROM 3606 TO 3652

TABLE 14-7′
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.370
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.01
PHINC= 0.21
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 500.0
RSH= 1.50

DEPTH	.SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3606	-72.	89.	0.23	0.17	1.5	0.00	0.23	0.23	0.941	0.04	23086.	0.03	34185.	0.05	18687.	0.91	0.10	1.34
3608	-77.	85.	0.24	0.17	1.5	0.00	0.24	0.24	0.706	0.04	23555.	0.03	39381.	0.06	16057.	0.84	0.11	1.45
3610	-83.	78.	0.27	0.17	1.1	0.00	0.28	0.28	0.294	0.04	24083.	0.04	25920.	0.06	16324.	0.84	0.06	1.89
3612	-83.	75.	0.26	0.17	0.9	0.00	0.26	0.26	0.118	0.04	24083.	0.05	19930.	0.04	22927.	0.98	0.05	1.98
3614	-84.	77.	0.28	0.16	0.9	0.00	0.29	0.29	0.235	0.04	24167.	0.05	20829.	0.05	19080.	0.90	0.05	2.01
3616	-86.	74.	0.20	0.15	1.2	0.00	0.20	0.20	0.059	0.04	24332.	0.04	24727.	0.03	32359.	1.14	0.06	2.04
3618	-86.	76.	0.18	0.14	1.9	0.00	0.18	0.18	0.176	0.04	24332.	0.04	25523.	0.04	26884.	1.05	0.06	2.03
3620	-86.	78.	0.20	0.15	1.6	0.00	0.20	0.20	0.294	0.04	24332.	0.02	51922.	0.04	24716.	1.01	0.15	1.63
3622	-86.	82.	0.27	0.15	1.2	0.00	0.28	0.28	0.529	0.04	24332.	0.06	15962.	0.06	16052.	0.83	0.04	2.17
3624	-86.	90.	0.25	0.16	0.9	0.00	0.25	0.25	1.000	0.04	24332.	0.05	20829.	0.04	25692.	1.02	0.05	2.10
3626	-82.	86.	0.28	0.17	1.1	0.00	0.29	0.29	0.765	0.04	23997.	0.03	32470.	0.06	16211.	0.84	0.08	1.75
3628	-81.	76.	0.32	0.17	0.9	0.00	0.33	0.33	0.176	0.04	23911.	0.06	15962.	0.07	13644.	0.78	0.04	1.96
3630	-81.	73.	0.35	0.17	0.7	0.00	0.36	0.36	0.000	0.04	23911.	0.05	21612.	0.06	15298.	0.82	0.05	1.87
3632	-81.	76.	0.33	0.17	0.6	0.00	0.34	0.34	0.176	0.04	23911.	0.04	23789.	0.05	18218.	0.88	0.06	1.84
3634	-80.	73.	0.32	0.17	0.7	0.00	0.33	0.33	0.000	0.04	23824.	0.04	22028.	0.05	17976.	0.88	0.05	1.83
3636	-80.	74.	0.33	0.17	0.6	0.00	0.34	0.34	0.059	0.04	23824.	0.04	27505.	0.05	21304.	0.95	0.07	1.74
3638	-80.	73.	0.30	0.15	0.7	0.00	0.31	0.31	0.000	0.04	23824.	0.04	23888.	0.05	20735.	0.94	0.06	1.80
3640	-80.	77.	0.31	0.15	0.7	0.00	0.32	0.32	0.235	0.04	23824.	0.05	19319.	0.05	19448.	0.91	0.05	1.87
3642	-80.	73.	0.31	0.16	0.7	0.00	0.32	0.32	0.000	0.04	23824.	0.04	22206.	0.05	19284.	0.91	0.06	1.82
3644	-80.	76.	0.30	0.16	0.7	0.00	0.31	0.31	0.176	0.04	23824.	0.05	21012.	0.05	20570.	0.94	0.05	1.84
3646	-79.	74.	0.33	0.17	0.7	0.00	0.34	0.34	0.059	0.04	23735.	0.03	34924.	0.06	17461.	0.87	0.09	1.59
3648	-79.	82.	0.27	0.16	0.9	0.00	0.28	0.28	0.529	0.04	23735.	0.05	18232.	0.05	21129.	0.95	0.04	1.84
3650	-80.	79.	0.27	0.17	9.1	0.00	0.28	0.28	0.353	0.04	23824.	-0.01	164628.	0.47	1806.	0.30	4.11	-0.14
3652	-74.	79.	0.26	0.17	0.9	0.00	0.26	0.26	0.353	0.04	23277.	0.05	21142.	0.04	24080.	1.02	0.05	1.61

WELL NUMBER = 14
FIELD : CERRO PRIETO
RANGE : FROM 3606 TO 3652

TABLE 14-8'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.334
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.01
PHINC= 0.21
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 450.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3606	-72.	89.	0.23	0.17	1.5	0.00	0.23	0.23	0.941	0.04	26327.	0.03	38356.	0.05	20958.	0.90	0.09	1.49
3608	-77.	85.	0.24	0.17	1.5	0.00	0.24	0.24	0.706	0.04	26859.	0.03	44207.	0.06	18000.	0.83	0.11	1.62
3610	-83.	78.	0.27	0.17	1.1	0.00	0.28	0.28	0.294	0.04	27454.	0.04	29056.	0.06	18300.	0.83	0.06	2.09
3612	-83.	75.	0.26	0.17	0.9	0.00	0.26	0.26	0.118	0.04	27454.	0.05	22321.	0.04	25731.	0.97	0.05	2.18
3614	-84.	77.	0.28	0.16	0.9	0.00	0.29	0.29	0.235	0.04	27548.	0.05	23332.	0.05	21401.	0.89	0.05	2.22
3616	-86.	74.	0.20	0.15	1.2	0.00	0.20	0.20	0.059	0.04	27733.	0.04	27713.	0.03	36360.	1.13	0.06	2.26
3618	-86.	76.	0.18	0.14	1.9	0.00	0.18	0.18	0.176	0.04	27733.	0.04	28609.	0.04	30189.	1.04	0.06	2.25
3620	-86.	78.	0.20	0.15	1.6	0.00	0.20	0.20	0.294	0.04	27733.	0.02	58337.	0.04	27747.	1.00	0.14	1.86
3622	-86.	82.	0.27	0.15	1.2	0.00	0.28	0.28	0.529	0.04	27733.	0.06	17863.	0.06	17993.	0.82	0.04	2.39
3624	-86.	90.	0.25	0.16	0.9	0.00	0.25	0.25	1.000	0.04	27733.	0.05	23332.	0.04	28846.	1.02	0.05	2.32
3626	-82.	86.	0.28	0.17	1.1	0.00	0.29	0.29	0.765	0.04	27358.	0.03	36425.	0.06	18173.	0.83	0.08	1.95
3628	-81.	76.	0.32	0.17	0.9	0.00	0.33	0.33	0.176	0.04	27261.	0.06	17863.	0.07	15286.	0.77	0.04	2.15
3630	-81.	73.	0.35	0.17	0.7	0.00	0.36	0.36	0.000	0.04	27261.	0.05	24212.	0.06	17146.	0.81	0.05	2.06
3632	-81.	76.	0.33	0.17	0.6	0.00	0.34	0.34	0.176	0.04	27261.	0.04	26659.	0.05	20431.	0.88	0.06	2.03
3634	-80.	73.	0.32	0.17	0.7	0.00	0.33	0.33	0.000	0.04	27162.	0.04	24679.	0.05	20158.	0.87	0.05	2.01
3636	-80.	74.	0.33	0.17	0.6	0.00	0.34	0.34	0.059	0.04	27162.	0.04	30838.	0.05	23904.	0.94	0.07	1.93
3638	-80.	73.	0.30	0.15	0.7	0.00	0.31	0.31	0.000	0.04	27162.	0.04	26770.	0.05	23264.	0.93	0.06	1.98
3640	-80.	77.	0.31	0.15	0.7	0.00	0.32	0.32	0.235	0.04	27162.	0.05	21635.	0.05	21815.	0.91	0.05	2.05
3642	-80.	73.	0.31	0.16	0.7	0.00	0.32	0.32	0.000	0.04	27162.	0.04	24880.	0.05	21631.	0.90	0.05	2.01
3644	-80.	76.	0.30	0.16	0.7	0.00	0.31	0.31	0.176	0.04	27162.	0.05	23538.	0.05	23078.	0.93	0.05	2.03
3646	-79.	74.	0.33	0.17	0.7	0.00	0.34	0.34	0.059	0.04	27062.	0.03	39188.	0.06	19579.	0.86	0.09	1.77
3648	-79.	82.	0.27	0.16	0.9	0.00	0.28	0.28	0.529	0.04	27062.	0.05	20414.	0.05	23707.	0.94	0.04	2.02
3650	-80.	79.	0.27	0.17	9.1	0.00	0.28	0.28	0.353	0.04	27162.	-0.01	185658.	0.47	2009.	0.30	4.30	-0.15
3652	-74.	79.	0.26	0.17	0.9	0.00	0.26	0.26	0.353	0.04	26544.	0.05	23684.	0.04	27031.	1.01	0.05	1.76

DRILLING REPORT ON WELL M-27

LOCATION:

The calculation of the coordinates uses as origin the coordinates for the center of Unit No. 1 of the Cerro Prieto Geothermal Power Plant; coordinates are referred to the rehabilitation system of the Irrigation District of the Department of Hydraulic Resources.

X = -16 915.15 m (55 495.2')

Y = -2028.51 m (6655.1')

Ground elevation (missing)

Rotary table elevation 3.35 m (11.0')

The well is located approximately 200.0 m (656.2') southwest of well M-21, 200.0 m (656.2') northeast of well M-31, and 130.0 m (426.5') northeast of well M-8.

DRILLING 50.8 cm (20"Ø) HOLE

The drilling was started at 23:15 hours on February 10, 1973, drilling with 37.5 cm (14-3/4"Ø) bit and drill string to a depth of 270.65 mbgl (887.9').

Pulled bit and drill string out to the surface.

Ran in 50.8 cm (20"Ø) hole opener followed by drill string, opened up the hole down to a depth of 270.65 mbgl (887.9')

Continued mud and hole, pulled drill string out to the surface.

CEMENTING 40.6 cm (16"Ø) CASING

Prepared and ran in 40.6 cm (16"Ø) grade H-40 96.7 kg/m (65 lb/ft) round thread casing down to 265.65 mbgl (871.5'), equipped with float shoe, retention collar, 18 centralizers, and two hammer-lock stop rings.

With equipment and personnel from the Byron Jackson Company, cemented the casing with 45 800 kg (100 970.7 lb) of type G cement modified 1:1; the cement came out to the surface.

After the cement had set, removed surface connections, cut 40.6 cm (16"Ø) casing 1.30 m (4.3') above the floor of the cellar.

Welded 40.6 cm (16"Ø) well-head to the casing and allowed the weld to cool.

HYDRAULIC TEST

Ran in 38.1 cm (15"Ø) bit, eight 16.5 cm (6-1/2"Ø) drill collars, and drill string to 240.62 mbgl (789.4'); reached the top of the cement.

Closed blowout preventer, satisfactorily tested casing, cementing job, and surface connections with 42 kg/cm^2 (600 psig).

DRILLING 38.1 cm (15"Ø) HOLE

With 38.1 cm (15"Ø) bit, drilled through cement plug, collar, and casing shoe. Continued drilling to a depth of 896.65 mbgl (2941.7').

Continued mud and hole, pulled drill string out to the surface.

ELECTRICAL LOGS

With equipment and personnel from the Schlumberger Company, took induction log from 268.9 to 901.5 mbrt (882' to 2957'), micrology from 269.2 to 901.2 mbrt (883' to 2956').

CEMENTING 29.9 cm (11-3/4"Ø) CASING

Prepared and ran in 29.9 cm (11-3/4"Ø) grade K-55 89.3 kg/m (60 lb/ft) and 70 kg/m (47 lb/ft) buttress thread casing down to 890.08 mbgl (2920.2'). It was equipped with a float shoe, a float collar, and 38 centralizers.

With equipment and personnel from the Byron Jackson Company, cemented the 29.9 cm (11-3/4"Ø) casing with 42.8 m^3 (1511.4 ft^3) of cement grout 1:2 and 14.1 m^3 (497.9 ft^3) in the proportion 1:1. The cement came out to the surface.

After the cement had set, removed blowout preventer and surface connections.

INSTALLING 29.9 cm (11-3/4"Ø) WELL-HEAD

With equipment and personnel from the Perfesa Company, cut 40.6 cm (16"Ø) and 29.9 cm (11-3/4"Ø) casings at 1.20 and 1.70 m (3.94' and 5.58'), respectively, above the floor of the cellar.

Welded 29.9 cm (11-3/4"Ø) by 30.5 cm (12"Ø) S-900, 3000 API well-head to the casing and allowed it to cool.

Installed adapter spool, blowout preventer, and surface connections.

HYDRAULIC TEST

Ran in 27.0 cm (10-5/8"Ø) bit followed by four 20.3 cm (8"Ø) and eight 16.5 cm (6-1/2"Ø) drill collars and 11.4 cm (4-1/2"Ø) fh drill string down to 645.83 mbgl (2118.9'), where it reached the top of the cement. Drilled through the cement plug down to a depth of 876.65 mbgl (2876.1').

Closed blowout preventer, satisfactorily tested casing, cementing job, and surface connections with a pressure of 56 kg/cm^2 (800 psig) for 30 min.

Drilled through collar and shoe, and drilled down to 896.65 mbgl (2941.7').

DRILLING 27.0 cm (10-5/8"Ø) HOLE

With 27.0 cm (10-5/8"Ø) bit and drill string, continued drilling to a depth of 946.15 mbgl (3104.1').

Pulled bit and drill string out to the surface.

Removed blowout preventer and surface connections.

Tested 29.9 cm (11-3/4"Ø) well-head, observed a pressure drop due to a defect in the well-head weld.

INSTALLING 29.9 cm (11-3/4"Ø) WELL-HEAD

With equipment and personnel from Timex, cut 29.9 cm (11-3/4"Ø) casing 1.575 m (5.17') above the floor of the cellar and again welded the well-head with inside and outside bead.

X-RAY LOG

With equipment and personnel from the Magna Flux Company, obtained x-ray log at the well-head weld, detecting a fault in this weld.

Rewelded the well-head and tested it satisfactorily with a pressure of 70 kg/cm^2 (1000 psig) for 30 min.

DRILLING 27.0 cm (10-5/8"Ø) HOLE

Installed blowout preventer and surface connections.

Ran in 27.0 cm (10-5/8"Ø) bit and drill string to the bottom, continued drilling to a depth of 1296.65 mbgl (4254.0').

Conditioned mud and hole, added 74 blocks of ice [9250 kg (20 392.6 lb)] to the mud to refrigerate the well.

Pulled the bit and drill string out to the surface.

LOGS

With equipment and personnel from the Schlumberger Company, took density log from 894.2 to 1300.0 mbrt (2933' to 4267'), neutron log from 894.2 to 1300.9 mbrt (2933' to 4267'), dual-induction log from 894.2 to 1299.1 mbrt (2933' to 4261'), and cementing log from 0 to 894.2 mbrt (0' to 2933').

With the cementing log it was observed that the zone 12.80 to 194.65 mbrt (42.0' to 638.6') was canalized.

THE FOLLOWING DEVIATIONS WERE OBTAINED DURING THE DRILLING

Depth	Deviation
296.65 mbgl (973.2')	0°20'
600.65 mbgl (1970.6')	0°15'
796.65 mbgl (2613.6')	0°20'
923.65 mbgl (3030.3')	0°10'
933.65 mbgl (3063.1')	0°40'
1186.65 mbgl (3893.2')	0°00'

CEMENTING 19.4 cm (7-5/8"Ø) CASING

Prepared and ran in 19.4 cm (7-5/8"Ø) grade K-55 and J-55 39.3 kg/m (26.4 lb/ft) buttress thread casing; the smooth casing remained at 1097.06 mbgl (3599.2') and the end of the slotted casing with the shoe remained at 1293.91 mbgl (4245.1').

The casing was equipped with a J collar, a float collar, cementing collar, blank collar, blank shoe, 73 centralizers, 4 canvas metal petal baskets, and 6 hammer-lock stop rings.

With equipment and personnel from the Byron Jackson Company, cemented the 19.4 cm (7-5/8"Ø) casing in two stages.

In the first stage cemented with 5.43 m^3 (191.8 ft^3) [4460 kg (9832.6 lb)] of cement in the form of 1:1 grout.

In the second stage cemented with 41.3 m^3 (1458.5 ft^3) [36 900 kg (81 349.7 lb)] of cement. While displacing, lost circulation at the surface for several minutes, reestablished circulation and observed that the cement was contaminated at the surface.

While the cement was setting, released pressure and removed cementing head.

Inserted 3 steel bars with probe cable inside the well, reached the top of the cement at 997.21 mbgl (3271.6').

Installed 30.5 cm (12"Ø) X 20.6 cm (8-1/2"Ø) centralizers, cut 19.4 cm (7-5/8"Ø) casing 0.15 m (0.49') above the 29.9 cm (11-3/4"Ø) well-head, installed blowout preventer and surface connections.

HYDRAULIC TEST

Ran in 16.5 cm (6-12/"Ø) bit and 11.4 cm (4-1/2"Ø) drill string down to 997.21 mbgl (3271.6'), where the top of the cement was reached.

Closed blowout preventer, satisfactorily tested casings, cementing job, and surface connections with a pressure of 70 kg/cm^2 (1000 psig) for 15 min.

Drilled through the cement plug and J collar to 1068.65 mbgl (3506.0'), drilled through float collar to 1076.50 mbgl (3531.8'), where the cementing collar was reached.

Pulled the bit and drill string out to the surface.

LOG FOR CEMENTING THE 19.4 cm (7-5/8"Ø) CASING

With equipment and personnel from the Schlumberger Company, obtained cementing log from 1082.9 to 15.2 mbrt (3552.8' to 49.9'), while noting that from 1082.9 to 665.7 mbgl (3552.8' to 2184.0') the adherence values were 77.5 kg/cm^2 (1102.3 psig) and from 665.7 to 273.7 mbgl (2184.0' to 898.0') the adherence values were very low, indicating that at 194.65 m (638.6') there was strong canalization with values of 9.15 kg/cm^2 (130.1 psig) and from 194.65 to 17.95 mbgl (638.6' to 58.9') adherence values were observed in the form of canalized bridges. There is a cement top with good adherence at a depth of 665.7 mbgl (2184.0').

HYDRAULIC TEST

Ran in 16.5 cm (6-12"Ø) bit and drill string until it reached the cementing collar, which was drilled through and the cement plug was drilled through down to a depth of 1091.65 mbgl (3581.5').

Closed blowout preventer, made a hydraulic test on various occasions without success; the pressure was increased to 63 kg/cm^2 (900 psig), dropping in 10 min to zero, since it was being held down at the cement outlets.

COMPLETION

With the 16.5 cm (6-1/2"Ø) bit, continued drilling through the cement to 1096.57 mbgl (3597.6'), reached blank collar, drilled through it and drilled through the cement plug down to 1268.65 mbgl (4162.2'). From this depth to 1293.85 mbgl (4244.9'), the inside of the slotted casing was found to be open.

Circulated at the bottom, cleaning the well of cement. Immediately pumped a 10 m^3 (353.1 ft^3) air pocket from the water and displaced with 15 m^3 (529.7 ft^3) of mud. Pulled the drill string out, disconnected pipe by pipe at the surface.

THERMAL LOG

With equipment and personnel from the Federal Electricity Commission, tried to obtain temperature log down to the bottom, but without success due to breakdown in the Kuster equipment.

Welded blank cover with outlet and 5.1 cm (2"Ø) valve on the 19.4 cm (7-5/8"Ø) casing. The construction of this well was considered completed at 15:00 h on October 16, 1973.

Compiled
(signed)
Raul Rivera Olguin

Reviewed
(signed)
Engineer Rene de Leon Botello
SUPERINTENDENT OF WELL DRILLING

Approved
(signed)
Engineer Bernardo Dominguez A.
GENERAL SUPERINTENDENT

SP-GAMMA RAY OVERLAYS WELL 27

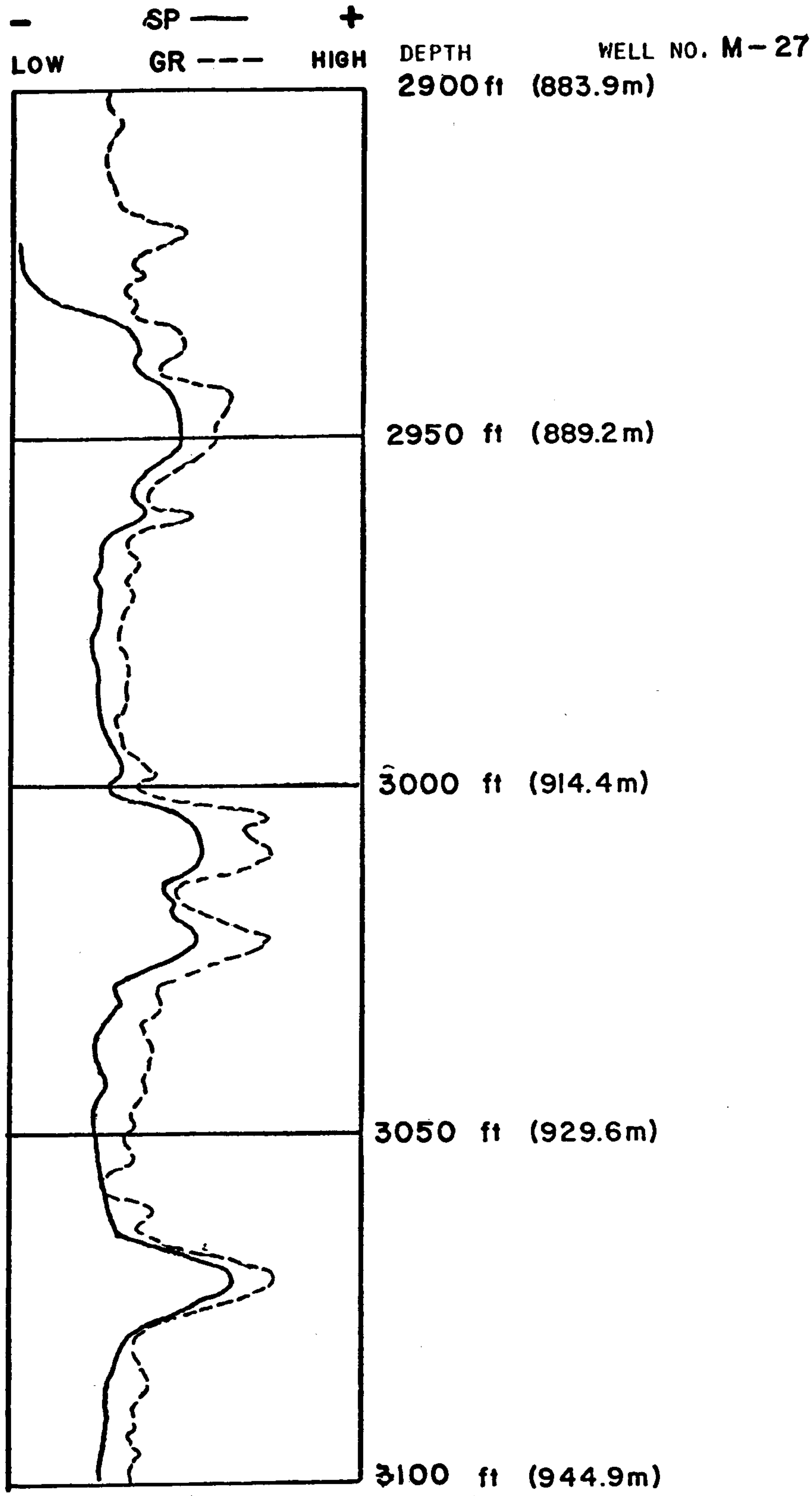

Fig. D-7. SP-Gamma Ray Overlay.

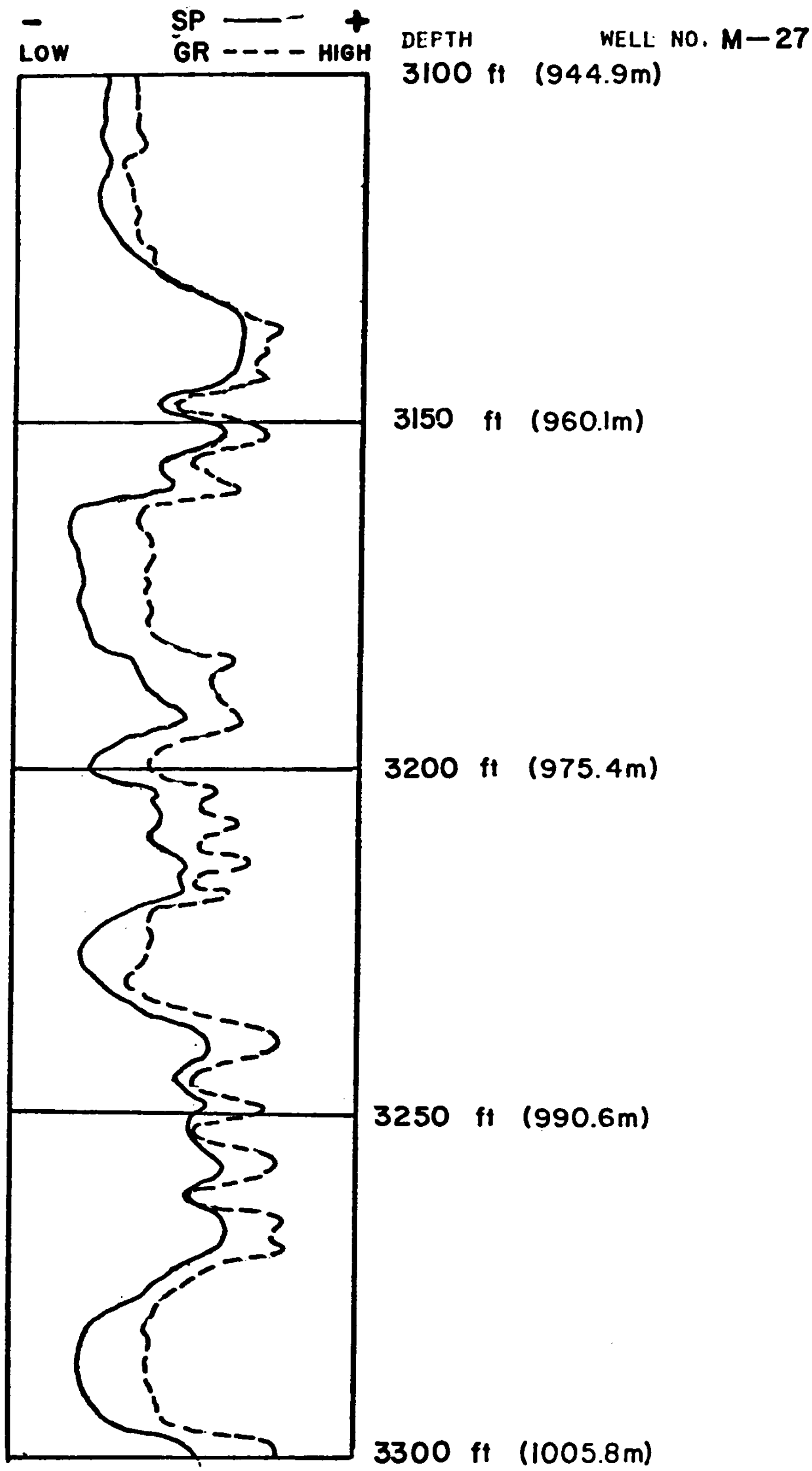

Fig. D-8. SP-Gamma Ray Overlay.

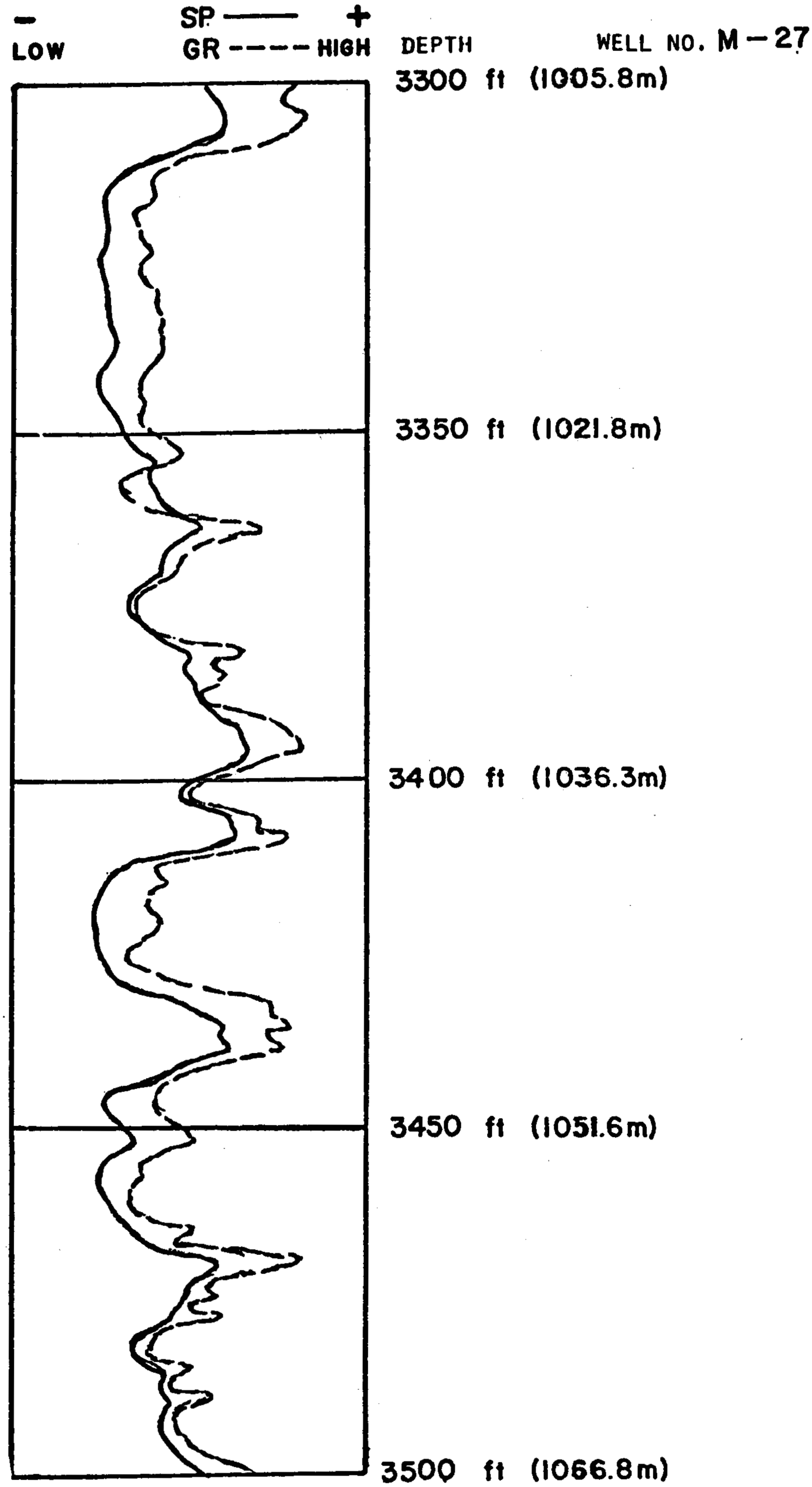

Fig. D-9. SP-Gamma Ray Overlay.

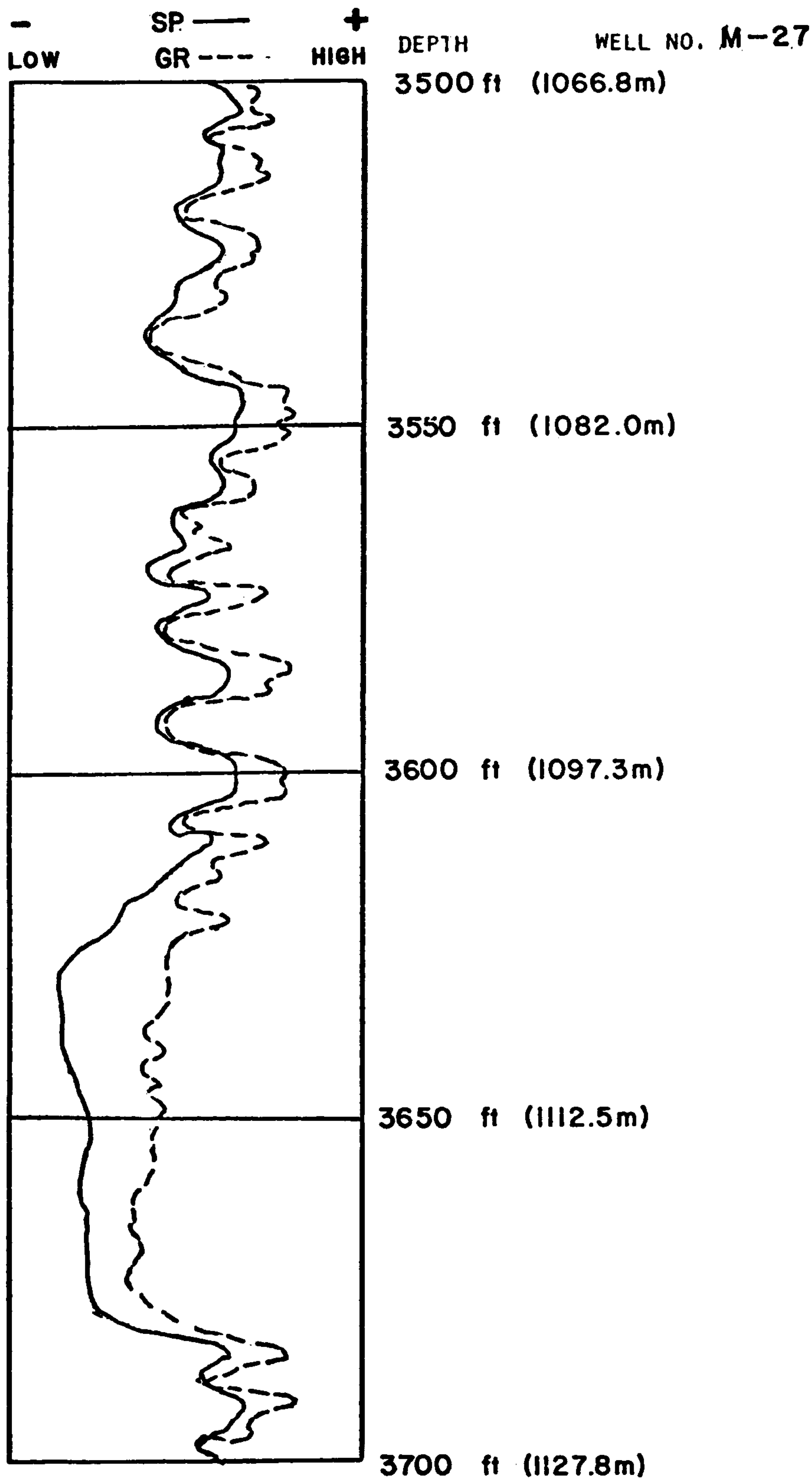

Fig. D-10. SP-Gamma Ray Overlay.

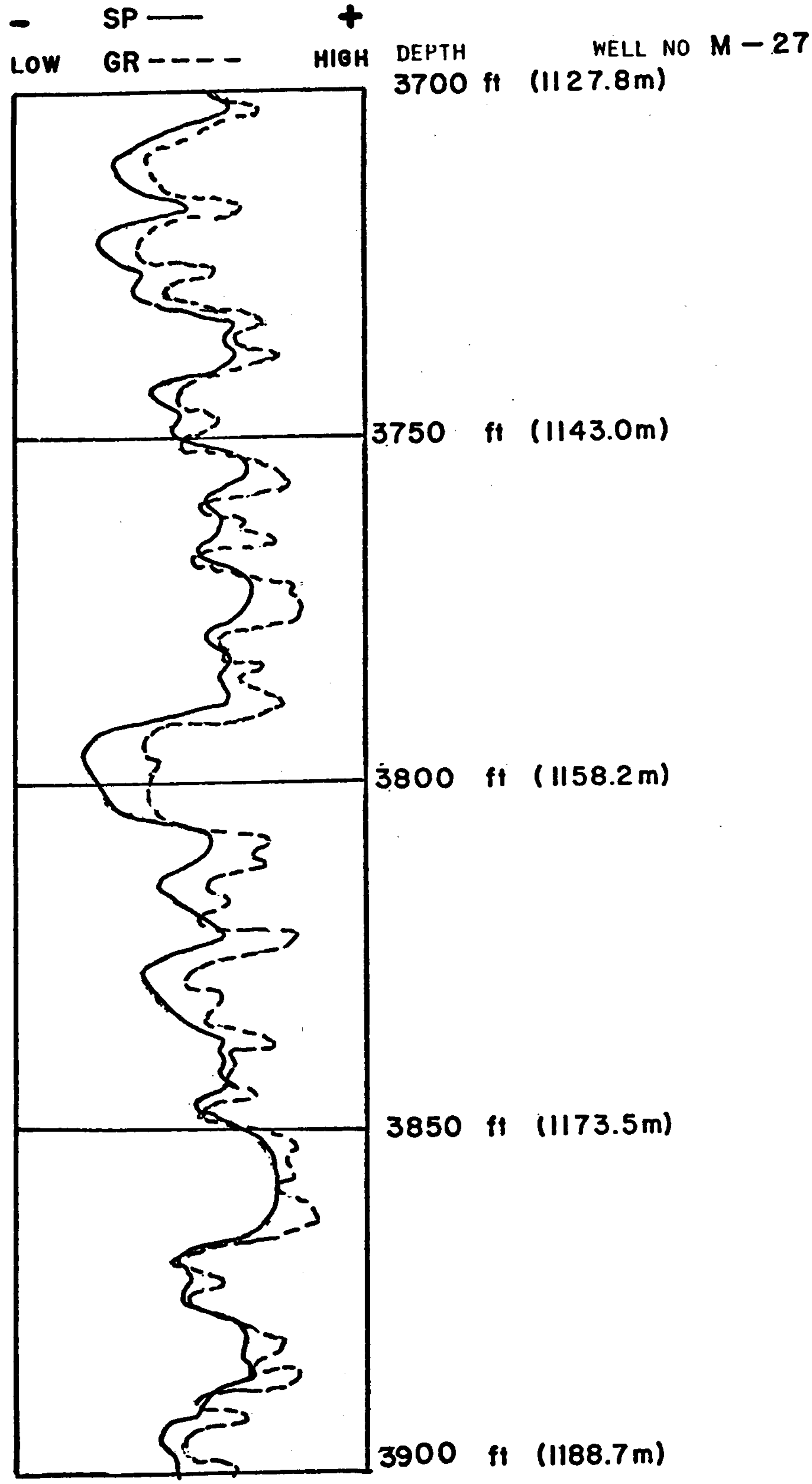

Fig. D-11. SP-Gamma Ray Overlay.

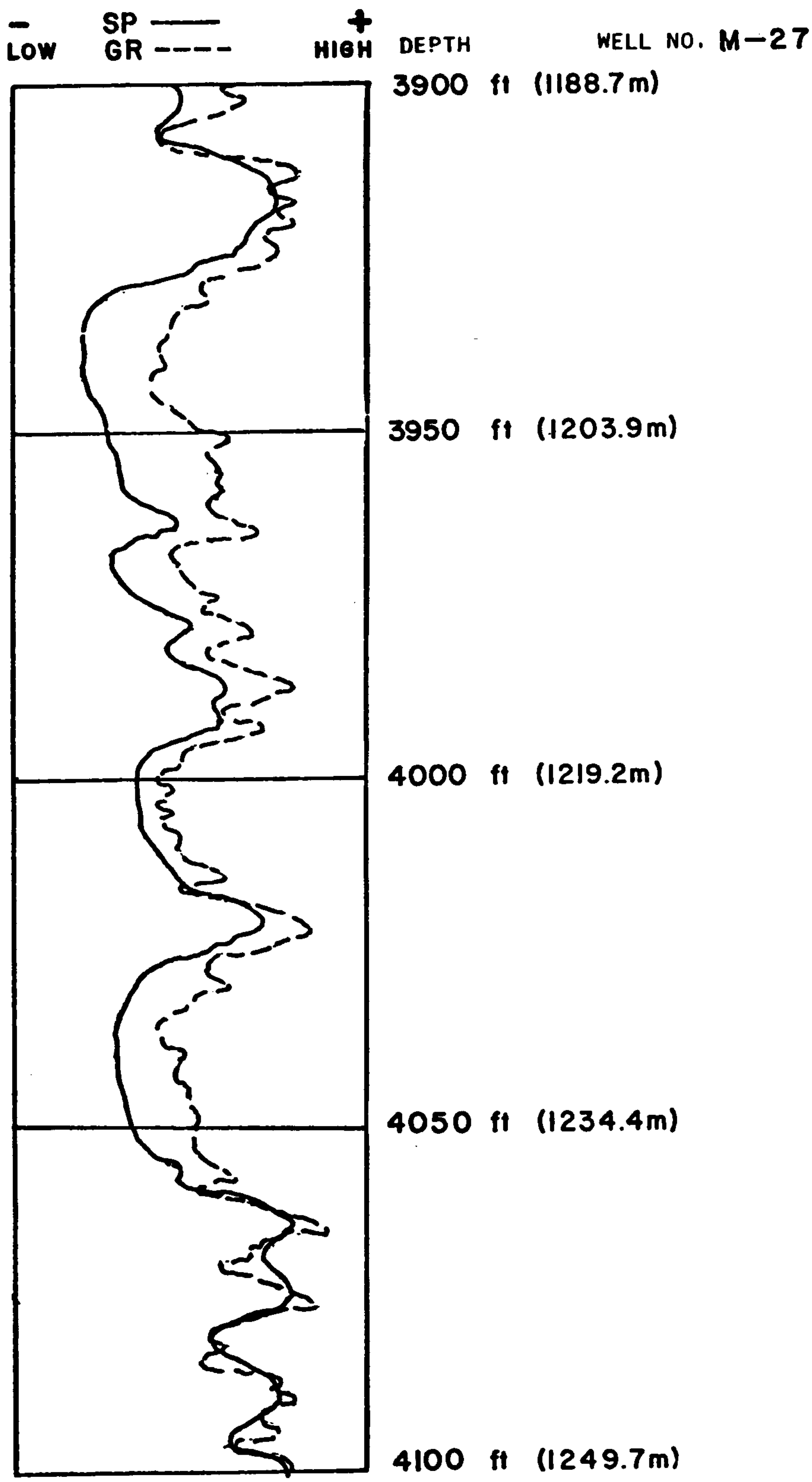

Fig. D-12. SP-Gamma Ray Overlay.

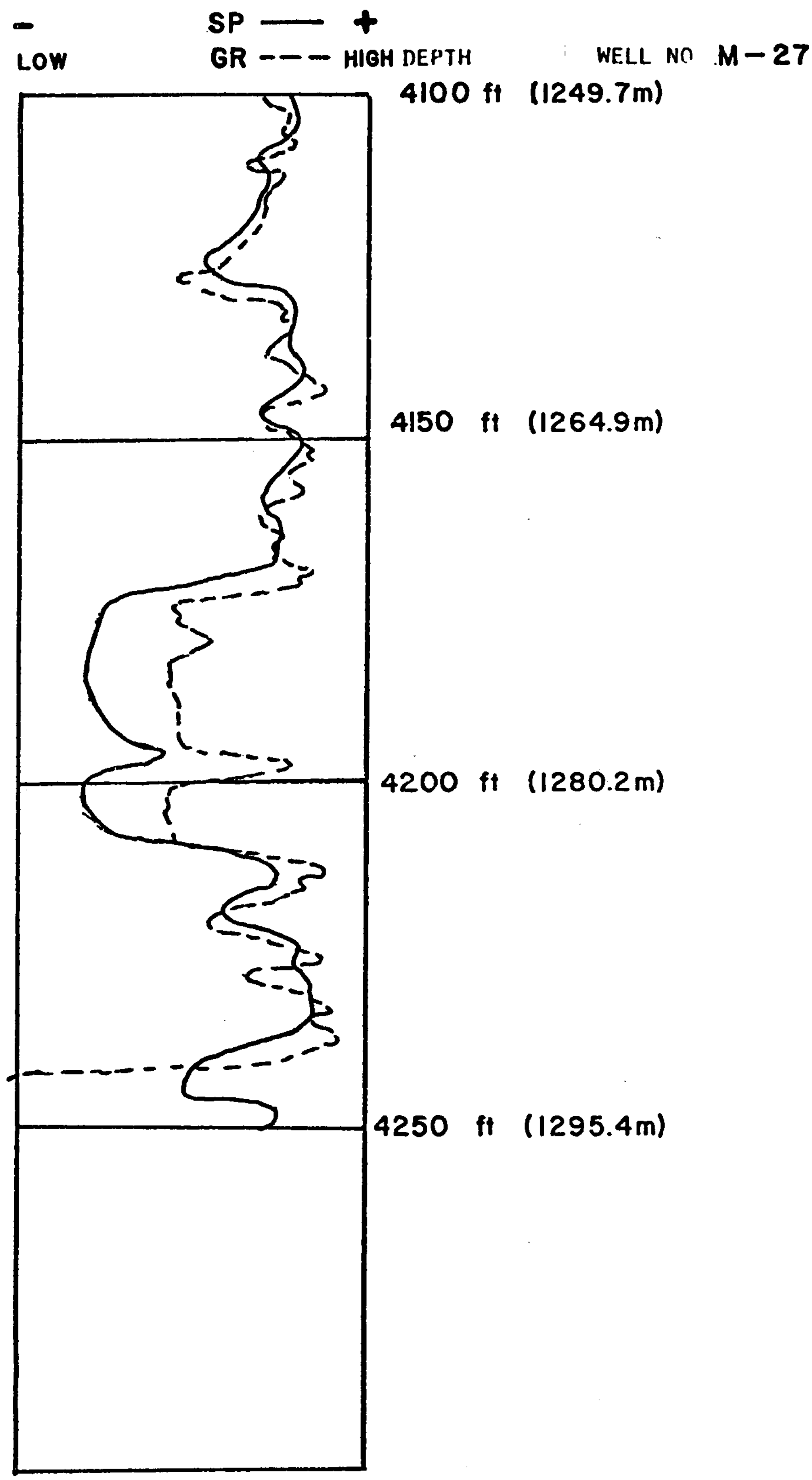

Fig. D-13. SP-Gamma Ray Overlay.

COMPUTED RESULTS WELL 27

WELL NUMBER = 27
FIELD : CERRO PRIETO
RANGE : FROM 3030 TO 3064 TABLE 27-1
COMPUTED DATA IS AS BELOW: Rmf= 0.500
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.04
PHINC= 0.29
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 202.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	

%FRSAPR Floating divide check PC= 33024

%FRSAPR Floating overflow PC= 31303

3030	-55.	91.	0.26	0.26	1.8	0.00	0.26	0.26	0.857	0.06	42976.	0.00	********	0.08	30706.	0.86		
3032	-54.	94.	0.22	0														
.24	2.2	0.08	0.22	0.23	1.000	0.06	42192.	0.21	10956.	0.07	34765.	0.88	0.04	1.88				
3034	-58.	89.	0.26	0.24	1.8	0.00	0.26	0.26	0.762	0.06	44611.	0.21	10951.	0.08	29951.	0.84	0.04	2.12
3036	-59.	89.	0.29	0.25	1.5	0.00	0.30	0.30	0.762	0.06	45208.	0.20	11119.	0.09	26784.	0.79	0.04	2.18
3038	-60.	89.	0.31	0.27	1.1	0.00	0.32	0.32	0.762	0.06	45801.	0.20	11101.	0.08	30815.	0.84	0.04	2.25
3040	-61.	88.	0.31	0.28	0.9	0.00	0.31	0.31	0.714	0.06	46190.	0.14	16385.	0.06	42346.	0.96	0.06	2.20
3042	-59.	87.	0.32	0.27	1.1	0.00	0.33	0.33	0.667	0.06	45016.	0.20	11089.	0.08	29396.	0.83	0.04	2.18
3044	-58.	89.	0.30	0.26	0.9	0.00	0.31	0.31	0.762	0.06	44424.	0.16	14312.	0.06	42344.	0.98	0.05	2.04
3046	-60.	87.	0.32	0.27	0.8	0.00	0.33	0.33	0.667	0.06	45605.	0.16	14651.	0.06	40397.	0.95	0.05	2.17
3048	-61.	85.	0.33	0.26	0.7	0.00	0.34	0.34	0.571	0.06	45991.	0.15	15082.	0.06	41993.	0.96	0.05	2.22
3050	-60.	85.	0.33	0.24	0.3	0.00	0.34	0.34	0.571	0.06	45411.	0.07	36058.	0.03	101419.	1.42	0.14	1.71
3052	-60.	84.	0.33	0.25	0.7	0.00	0.34	0.34	0.524	0.06	45411.	0.15	15345.	0.06	44994.	1.00	0.05	2.14
3054	-59.	85.	0.32	0.27	0.8	0.00	0.33	0.33	0.571	0.06	44827.	0.14	16728.	0.06	42916.	0.98	0.06	2.05
3056	-58.	79.	0.29	0.26	0.7	0.00	0.29	0.29	0.286	0.06	44055.	0.13	18370.	0.04	59057.	1.14	0.06	1.95
3058	-58.	76.	0.20	0.20	1.0	0.00	0.20	0.20	0.143	0.06	44055.	0.11	21083.	0.02	123939.	1.57	0.07	1.89
3060	-57.	73.	0.24	0.23	1.0	0.00	0.24	0.24	0.000	0.06	43469.	0.12	19336.	0.04	72887.	1.25	0.07	1.86
3062	-56.	89.	0.27	0.27	0.7	0.00	0.27	0.27	0.762	0.06	42879.	0.10	22851.	0.04	74754.	1.28	0.08	1.73
3064	-55.	86.	0.27	0.25	0.8	0.00	0.27	0.27	0.619	0.06	42117.	0.10	23571.	0.04	62360.	1.19	0.09	1.65

WELL NUMBER = 27
FIELD : CERRO PRIETO
RANGE : FROM 3030 TO 3064

TABLE 27-2'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.04
PHINC= 0.29
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 450.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3030	-55.	91.	0.26	0.26	1.8	0.00	0.26	0.26	0.857	0.04	24985.	0.05	20110.	0.08	12800.	0.74	0.04	1.20
3032	-54.	94.	0.22	0.24	2.2	0.08	0.22	0.23	1.000	0.04	24859.	0.06	19163.	0.07	14644.	0.76	0.04	1.18
3034	-58.	89.	0.26	0.24	1.8	0.00	0.26	0.26	0.762	0.04	25355.	0.06	19153.	0.08	12560.	0.73	0.04	1.30
3036	-59.	89.	0.29	0.25	1.5	0.00	0.30	0.30	0.762	0.04	25476.	0.06	19452.	0.09	11264.	0.69	0.04	1.32
3038	-60.	89.	0.31	0.27	1.1	0.00	0.32	0.32	0.762	0.04	25595.	0.06	19421.	0.08	12912.	0.73	0.04	1.35
3040	-61.	88.	0.31	0.28	0.9	0.00	0.31	0.31	0.714	0.04	25713.	0.04	28857.	0.06	17694.	0.84	0.06	1.27
3042	-59.	87.	0.32	0.27	1.1	0.00	0.33	0.33	0.667	0.04	25476.	0.06	19400.	0.08	12397.	0.72	0.04	1.32
3044	-58.	89.	0.30	0.26	0.9	0.00	0.31	0.31	0.762	0.04	25355.	0.04	25148.	0.06	17694.	0.85	0.05	1.22
3046	-60.	87.	0.32	0.27	0.8	0.00	0.33	0.33	0.667	0.04	25595.	0.04	25753.	0.06	16900.	0.83	0.05	1.27
3048	-61.	85.	0.33	0.26	0.7	0.00	0.34	0.34	0.571	0.04	25713.	0.04	26524.	0.06	17643.	0.84	0.06	1.30
3050	-60.	85.	0.33	0.24	0.3	0.00	0.34	0.34	0.571	0.04	25595.	0.02	64346.	0.03	41690.	1.24	0.20	0.77
3052	-60.	84.	0.33	0.25	0.7	0.00	0.34	0.34	0.524	0.04	25595.	0.04	26994.	0.06	18871.	0.87	0.06	1.26
3054	-59.	85.	0.32	0.27	0.8	0.00	0.33	0.33	0.571	0.04	25476.	0.04	29470.	0.06	18021.	0.86	0.06	1.20
3056	-58.	79.	0.29	0.26	0.7	0.00	0.29	0.29	0.286	0.04	25355.	0.04	32415.	0.04	24733.	0.99	0.07	1.13
3058	-58.	76.	0.20	0.20	1.0	0.00	0.20	0.20	0.143	0.04	25355.	0.03	37289.	0.02	50973.	1.36	0.09	1.07
3060	-57.	73.	0.24	0.23	1.0	0.00	0.24	0.24	0.000	0.04	25233.	0.03	34149.	0.04	30367.	1.09	0.08	1.08
3062	-56.	89.	0.27	0.27	0.7	0.00	0.27	0.27	0.762	0.04	25110.	0.03	40470.	0.04	31125.	1.10	0.10	0.97
3064	-55.	86.	0.27	0.25	0.8	0.00	0.27	0.27	0.619	0.04	24985.	0.03	41765.	0.04	26218.	1.02	0.10	0.92

WELL NUMBER = 27
FIELD : CERRO PRIETO
RANGE : FROM 3030 TO 3064

TABLE 27-3′
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.04
PHINC= 0.29
AN= 1.00
AM= 2.00
RWCLY= 0.10
TDEEP= 450.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3030	-55.	91.	0.26	0.26	1.8	0.00	0.26	0.26	0.857	0.04	24985.	0.05	20110.	0.12	8263.	0.60	0.04	1.20
3032	-54.	94.	0.22	0.24	2.2	0.08	0.22	0.23	1.000	0.04	24859.	0.06	19163.	0.11	8845.	0.61	0.04	1.18
3034	-58.	89.	0.26	0.24	1.8	0.00	0.26	0.26	0.762	0.04	25355.	0.06	19153.	0.12	8142.	0.60	0.04	1.30
3036	-59.	89.	0.29	0.25	1.5	0.00	0.30	0.30	0.762	0.04	25476.	0.06	19452.	0.13	7597.	0.57	0.04	1.32
3038	-60.	89.	0.31	0.27	1.1	0.00	0.32	0.32	0.762	0.04	25595.	0.06	19421.	0.11	8880.	0.62	0.04	1.35
3040	-61.	88.	0.31	0.28	0.9	0.00	0.31	0.31	0.714	0.04	25713.	0.04	28857.	0.09	12105.	0.71	0.06	1.27
3042	-59.	87.	0.32	0.27	1.1	0.00	0.33	0.33	0.667	0.04	25476.	0.06	19400.	0.12	8630.	0.61	0.04	1.32
3044	-58.	89.	0.30	0.26	0.9	0.00	0.31	0.31	0.762	0.04	25355.	0.04	25148.	0.09	11998.	0.71	0.05	1.22
3046	-60.	87.	0.32	0.27	0.8	0.00	0.33	0.33	0.667	0.04	25595.	0.04	25753.	0.09	11724.	0.70	0.05	1.27
3048	-61.	85.	0.33	0.26	0.7	0.00	0.34	0.34	0.571	0.04	25713.	0.04	26524.	0.08	12392.	0.72	0.06	1.30
3050	-60.	85.	0.33	0.24	0.3	0.00	0.34	0.34	0.571	0.04	25595.	0.02	64346.	0.04	29109.	1.06	0.20	0.77
3052	-60.	84.	0.33	0.25	0.7	0.00	0.34	0.34	0.524	0.04	25595.	0.04	26994.	0.08	13265.	0.74	0.06	1.26
3054	-59.	85.	0.32	0.27	0.8	0.00	0.33	0.33	0.571	0.04	25476.	0.04	29470.	0.08	12492.	0.72	0.06	1.20
3056	-58.	79.	0.29	0.26	0.7	0.00	0.29	0.29	0.286	0.04	25355.	0.04	32415.	0.06	16494.	0.82	0.07	1.13
3058	-58.	76.	0.20	0.20	1.0	0.00	0.20	0.20	0.143	0.04	25355.	0.03	37289.	0.04	29584.	1.07	0.09	1.07
3060	-57.	73.	0.24	0.23	1.0	0.00	0.24	0.24	0.000	0.04	25233.	0.03	34149.	0.06	18913.	0.88	0.08	1.08
3062	-56.	89.	0.27	0.27	0.7	0.00	0.27	0.27	0.762	0.04	25110.	0.03	40470.	0.05	20106.	0.90	0.10	0.97
3064	-55.	86.	0.27	0.25	0.8	0.00	0.27	0.27	0.619	0.04	24985.	0.03	41765.	0.06	17040.	0.84	0.10	0.92

WELL NUMBER = 27
FIELD : CERRO PRIETO
RANGE : FROM 3030 TO 3064

TABLE 27-4'

TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.04
PHINC= 0.29
AN= 1.00
AM= 2.50
RWCLY= 0.10
TDEEP= 450.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3030	-55.	91.	0.26	0.26	1.8	0.00	0.26	0.26	0.857	0.04	24985.	0.05	20110.	0.06	17194.	0.84	0.04	1.20
3032	-54.	94.	0.22	0.24	2.2	0.08	0.22	0.23	1.000	0.04	24859.	0.06	19163.	0.05	20488.	0.87	0.04	1.18
3034	-58.	89.	0.26	0.24	1.8	0.00	0.26	0.26	0.762	0.04	25355.	0.06	19153.	0.06	16822.	0.83	0.04	1.30
3036	-59.	89.	0.29	0.25	1.5	0.00	0.30	0.30	0.762	0.04	25476.	0.06	19452.	0.07	14685.	0.78	0.04	1.32
3038	-60.	89.	0.31	0.27	1.1	0.00	0.32	0.32	0.762	0.04	25595.	0.06	19421.	0.06	16613.	0.82	0.04	1.35
3040	-61.	88.	0.31	0.28	0.9	0.00	0.31	0.31	0.714	0.04	25713.	0.04	28857.	0.05	22846.	0.95	0.06	1.27
3042	-59.	87.	0.32	0.27	1.1	0.00	0.33	0.33	0.667	0.04	25476.	0.06	19400.	0.07	15819.	0.81	0.04	1.32
3044	-58.	89.	0.30	0.26	0.9	0.00	0.31	0.31	0.762	0.04	25355.	0.04	25148.	0.05	22982.	0.96	0.05	1.22
3046	-60.	87.	0.32	0.27	0.8	0.00	0.33	0.33	0.667	0.04	25595.	0.04	25753.	0.05	21615.	0.93	0.05	1.27
3048	-61.	85.	0.33	0.26	0.7	0.00	0.34	0.34	0.571	0.04	25713.	0.04	26524.	0.05	22376.	0.94	0.06	1.30
3050	-60.	85.	0.33	0.24	0.3	0.00	0.34	0.34	0.571	0.04	25595.	0.02	64346.	0.02	53081.	1.38	0.20	0.77
3052	-60.	84.	0.33	0.25	0.7	0.00	0.34	0.34	0.524	0.04	25595.	0.04	26994.	0.05	23920.	0.97	0.06	1.26
3054	-59.	85.	0.32	0.27	0.8	0.00	0.33	0.33	0.571	0.04	25476.	0.04	29470.	0.05	23059.	0.96	0.06	1.20
3056	-58.	79.	0.29	0.26	0.7	0.00	0.29	0.29	0.286	0.04	25355.	0.04	32415.	0.03	32489.	1.12	0.07	1.13
3058	-58.	76.	0.20	0.20	1.0	0.00	0.20	0.20	0.143	0.04	25355.	0.03	37289.	0.02	73605.	1.60	0.09	1.07
3060	-57.	73.	0.24	0.23	1.0	0.00	0.24	0.24	0.000	0.04	25233.	0.03	34149.	0.03	41791.	1.25	0.08	1.08
3062	-56.	89.	0.27	0.27	0.7	0.00	0.27	0.27	0.762	0.04	25110.	0.03	40470.	0.03	41782.	1.25	0.10	0.97
3064	-55.	86.	0.27	0.25	0.8	0.00	0.27	0.27	0.619	0.04	24985.	0.03	41765.	0.03	35051.	1.16	0.10	0.92

WELL NUMBER = 27
FIELD : CERRO PRIETO
RANGE : FROM 3030 TO 3064

TABLE 27-5′
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.500

Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.04
PHINC= 0.29
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 450.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3030	-55.	91.	0.26	0.26	1.8	0.00	0.26	0.26	0.857	0.05	21178.	0.09	11488.	0.08	12800.	0.80	0.04	1.20
3032	-54.	94.	0.22	0.24	2.2	0.08	0.22	0.23	1.000	0.05	21017.	0.09	10956.	0.07	14644.	0.81	0.04	1.18
3034	-58.	89.	0.26	0.24	1.8	0.00	0.26	0.26	0.762	0.05	21652.	0.09	10951.	0.08	12560.	0.78	0.04	1.30
3036	-59.	89.	0.29	0.25	1.5	0.00	0.30	0.30	0.762	0.05	21808.	0.09	11119.	0.09	11264.	0.74	0.04	1.32
3038	-60.	89.	0.31	0.27	1.1	0.00	0.32	0.32	0.762	0.05	21963.	0.09	11101.	0.08	12912.	0.79	0.04	1.35
3040	-61.	88.	0.31	0.28	0.9	0.00	0.31	0.31	0.714	0.05	22116.	0.06	16385.	0.06	17694.	0.90	0.06	1.27
3042	-59.	87.	0.32	0.27	1.1	0.00	0.33	0.33	0.667	0.05	21808.	0.09	11089.	0.08	12397.	0.77	0.04	1.32
3044	-58.	89.	0.30	0.26	0.9	0.00	0.31	0.31	0.762	0.05	21652.	0.07	14312.	0.06	17694.	0.91	0.05	1.22
3046	-60.	87.	0.32	0.27	0.8	0.00	0.33	0.33	0.667	0.05	21963.	0.07	14651.	0.06	16900.	0.89	0.05	1.27
3048	-61.	85.	0.33	0.26	0.7	0.00	0.34	0.34	0.571	0.05	22116.	0.07	15082.	0.06	17643.	0.90	0.06	1.30
3050	-60.	85.	0.33	0.24	0.3	0.00	0.34	0.34	0.571	0.05	21963.	0.03	36058.	0.03	41690.	1.33	0.20	0.77
3052	-60.	84.	0.33	0.25	0.7	0.00	0.34	0.34	0.524	0.05	21963.	0.07	15345.	0.06	18871.	0.93	0.06	1.26
3054	-59.	85.	0.32	0.27	0.8	0.00	0.33	0.33	0.571	0.05	21808.	0.06	16728.	0.06	18021.	0.92	0.06	1.20
3056	-58.	79.	0.29	0.26	0.7	0.00	0.29	0.29	0.286	0.05	21652.	0.06	18370.	0.04	24733.	1.06	0.07	1.13
3058	-58.	76.	0.20	0.20	1.0	0.00	0.20	0.20	0.143	0.05	21652.	0.05	21083.	0.02	50973.	1.46	0.09	1.07
3060	-57.	73.	0.24	0.23	1.0	0.00	0.24	0.24	0.000	0.05	21495.	0.06	19336.	0.04	30367.	1.17	0.08	1.08
3062	-56.	89.	0.27	0.27	0.7	0.00	0.27	0.27	0.762	0.05	21337.	0.05	22851.	0.04	31125.	1.18	0.10	0.97
3064	-55.	86.	0.27	0.25	0.8	0.00	0.27	0.27	0.619	0.05	21178.	0.05	23571.	0.04	26218.	1.10	0.10	0.92

WELL NUMBER = 27
FIELD : CERRO PRIETO
RANGE : FROM 3030 TO 3064

TABLE 27-6
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.500
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.04
PHINC= 0.29
AN= 1.00
AM= 2.50
RWCLY= 0.10
TDEEP= 450.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3030	-55.	91.	0.26	0.26	1.8	0.00	0.26	0.26	0.857	0.05	21178.	0.09	11488.	0.06	17194.	0.91	0.04	1.20
3032	-54.	94.	0.22	0.24	2.2	0.08	0.22	0.23	1.000	0.05	21017.	0.09	10956.	0.05	20488.	0.94	0.04	1.18
3034	-58.	89.	0.26	0.24	1.8	0.00	0.26	0.26	0.762	0.05	21652.	0.09	10951.	0.06	16822.	0.89	0.04	1.30
3036	-59.	89.	0.29	0.25	1.5	0.00	0.30	0.30	0.762	0.05	21808.	0.09	11119.	0.07	14685.	0.84	0.04	1.32
3038	-60.	89.	0.31	0.27	1.1	0.00	0.32	0.32	0.762	0.05	21963.	0.09	11101.	0.06	16613.	0.88	0.04	1.35
3040	-61.	88.	0.31	0.28	0.9	0.00	0.31	0.31	0.714	0.05	22116.	0.06	16385.	0.05	22846.	1.01	0.06	1.27
3042	-59.	87.	0.32	0.27	1.1	0.00	0.33	0.33	0.667	0.05	21808.	0.09	11089.	0.07	15819.	0.86	0.04	1.32
3044	-58.	89.	0.30	0.26	0.9	0.00	0.31	0.31	0.762	0.05	21652.	0.07	14312.	0.05	22982.	1.03	0.05	1.22
3046	-60.	87.	0.32	0.27	0.8	0.00	0.33	0.33	0.667	0.05	21963.	0.07	14651.	0.05	21615.	0.99	0.05	1.27
3048	-61.	85.	0.33	0.26	0.7	0.00	0.34	0.34	0.571	0.05	22116.	0.07	15082.	0.05	22376.	1.01	0.06	1.30
3050	-60.	85.	0.33	0.24	0.3	0.00	0.34	0.34	0.571	0.05	21963.	0.03	36058.	0.02	53081.	1.48	0.20	0.77
3052	-60.	84.	0.33	0.25	0.7	0.00	0.34	0.34	0.524	0.05	21963.	0.07	15345.	0.05	23920.	1.04	0.06	1.26
3054	-59.	85.	0.32	0.27	0.8	0.00	0.33	0.33	0.571	0.05	21808.	0.06	16728.	0.05	23059.	1.03	0.06	1.20
3056	-58.	79.	0.29	0.26	0.7	0.00	0.29	0.29	0.286	0.05	21652.	0.06	18370.	0.03	32489.	1.20	0.07	1.13
3058	-58.	76.	0.20	0.20	1.0	0.00	0.20	0.20	0.143	0.05	21652.	0.05	21083.	0.02	73605.	1.72	0.09	1.07
3060	-57.	73.	0.24	0.23	1.0	0.00	0.24	0.24	0.000	0.05	21495.	0.06	19336.	0.03	41791.	1.35	0.08	1.08
3062	-56.	89.	0.27	0.27	0.7	0.00	0.27	0.27	0.762	0.05	21337.	0.05	22851.	0.03	41782.	1.35	0.10	0.97
3064	-55.	86.	0.27	0.25	0.8	0.00	0.27	0.27	0.619	0.05	21178.	0.05	23571.	0.03	35051.	1.25	0.10	0.92

WELL NUMBER = 27
FIELD : CERRO PRIETO
RANGE : FROM 3030 TO 3064

TABLE 27-7′
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.500
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.04
PHINC= 0.29
AN= 1.00
AM= 2.00
RWCLY= 0.10
TDEEP= 450.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3030	-55.	91.	0.26	0.26	1.8	0.00	0.26	0.26	0.857	0.05	21178.	0.09	11488.	0.12	8263.	0.65	0.04	1.20
3032	-54.	94.	0.22	0.24	2.2	0.08	0.22	0.23	1.000	0.05	21017.	0.09	10956.	0.11	8845.	0.65	0.04	1.18
3034	-58.	89.	0.26	0.24	1.8	0.00	0.26	0.26	0.762	0.05	21652.	0.09	10951.	0.12	8142.	0.64	0.04	1.30
3036	-59.	89.	0.29	0.25	1.5	0.00	0.30	0.30	0.762	0.05	21808.	0.09	11119.	0.13	7597.	0.62	0.04	1.32
3038	-60.	89.	0.31	0.27	1.1	0.00	0.32	0.32	0.762	0.05	21963.	0.09	11101.	0.11	8880.	0.66	0.04	1.35
3040	-61.	88.	0.31	0.28	0.9	0.00	0.31	0.31	0.714	0.05	22116.	0.06	16385.	0.09	12105.	0.76	0.06	1.27
3042	-59.	87.	0.32	0.27	1.1	0.00	0.33	0.33	0.667	0.05	21808.	0.09	11089.	0.12	8630.	0.65	0.04	1.32
3044	-58.	89.	0.30	0.26	0.9	0.00	0.31	0.31	0.762	0.05	21652.	0.07	14312.	0.09	11998.	0.76	0.05	1.22
3046	-60.	87.	0.32	0.27	0.8	0.00	0.33	0.33	0.667	0.05	21963.	0.07	14651.	0.09	11724.	0.75	0.05	1.27
3048	-61.	85.	0.33	0.26	0.7	0.00	0.34	0.34	0.571	0.05	22116.	0.07	15082.	0.08	12392.	0.77	0.06	1.30
3050	-60.	85.	0.33	0.24	0.3	0.00	0.34	0.34	0.571	0.05	21963.	0.03	36058.	0.04	29109.	1.13	0.20	0.77
3052	-60.	84.	0.33	0.25	0.7	0.00	0.34	0.34	0.524	0.05	21963.	0.07	15345.	0.08	13265.	0.80	0.06	1.26
3054	-59.	85.	0.32	0.27	0.8	0.00	0.33	0.33	0.571	0.05	21808.	0.06	16728.	0.08	12492.	0.78	0.06	1.20
3056	-58.	79.	0.29	0.26	0.7	0.00	0.29	0.29	0.286	0.05	21652.	0.06	18370.	0.06	16494.	0.88	0.07	1.13
3058	-58.	76.	0.20	0.20	1.0	0.00	0.20	0.20	0.143	0.05	21652.	0.05	21083.	0.04	29584.	1.15	0.09	1.07
3060	-57.	73.	0.24	0.23	1.0	0.00	0.24	0.24	0.000	0.05	21495.	0.06	19336.	0.06	18913.	0.94	0.08	1.08
3062	-56.	89.	0.27	0.27	0.7	0.00	0.27	0.27	0.762	0.05	21337.	0.05	22851.	0.05	20106.	0.97	0.10	0.97
3064	-55.	86.	0.27	0.25	0.8	0.00	0.27	0.27	0.619	0.05	21178.	0.05	23571.	0.06	17040.	0.91	0.10	0.92

WELL NUMBER = 27
FIELD : CERRO PRIETO
RANGE : FROM 3630 TO 3680 TABLE 27-8′
COMPUTED DATA IS AS BELOW: Rmf= 0.500
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.04
PHINC= 0.29
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 274.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3630	-72.	93.	0.27	0.13	10.3	0.00	0.29	0.29	0.667	0.05	39056.	0.42	3699.	0.61	2537.	0.28	0.01	2.76
3632	-72.	94.	0.26	0.17	6.8	0.00	0.27	0.27	0.733	0.05	38915.	0.26	6098.	0.34	4572.	0.37	0.02	2.70
3634	-72.	94.	0.26	0.16	6.6	0.00	0.28	0.28	0.733	0.05	38915.	0.29	5443.	0.34	4647.	0.38	0.02	2.71
3636	-72.	91.	0.29	0.14	5.4	0.00	0.31	0.31	0.533	0.05	38915.	0.26	6241.	0.37	4192.	0.36	0.02	2.69
3638	-72.	90.	0.30	0.14	5.2	0.00	0.33	0.33	0.467	0.05	38915.	0.03	58654.	0.39	4001.	0.35	0.26	1.59
3640	-72.	91.	0.31	0.15	45.2	0.00	0.34	0.34	0.533	0.05	38776.	1.89	797.	3.67	416.	0.11	0.00	2.82
3642	-70.	90.	0.33	0.13	5.1	0.00	0.36	0.36	0.467	0.05	38126.	0.15	11060.	0.49	3133.	0.32	0.04	2.45
3644	-69.	87.	0.32	0.13	5.1	0.00	0.35	0.35	0.267	0.05	37796.	0.15	11041.	0.46	3385.	0.33	0.04	2.38
3646	-68.	91.	0.29	0.18	3.5	0.00	0.31	0.31	0.533	0.05	37462.	0.15	11360.	0.24	6842.	0.46	0.04	2.31
3648	-66.	88.	0.30	0.20	1.6	0.00	0.32	0.32	0.333	0.05	36660.	0.15	11419.	0.11	14954.	0.67	0.04	2.19
3650	-64.	91.	0.30	0.20	0.8	0.00	0.32	0.32	0.533	0.05	35975.	0.12	13636.	0.06	32459.	0.96	0.05	2.03
3652	-64.	91.	0.30	0.19	0.8	0.00	0.32	0.32	0.533	0.05	35975.	0.10	16997.	0.06	32962.	0.96	0.06	1.95
3654	-63.	91.	0.29	0.18	1.1	0.00	0.31	0.31	0.533	0.05	35629.	0.14	12005.	0.07	24377.	0.84	0.04	2.01
3656	-64.	93.	0.29	0.20	1.2	0.00	0.30	0.30	0.667	0.05	35854.	0.14	11488.	0.07	23737.	0.83	0.04	2.07
3658	-65.	91.	0.28	0.20	1.3	0.00	0.29	0.29	0.533	0.05	36195.	0.12	13780.	0.07	23896.	0.83	0.05	2.07
3660	-65.	89.	0.28	0.19	0.9	0.00	0.29	0.29	0.400	0.05	36195.	0.10	16941.	0.06	32388.	0.95	0.06	2.01
3662	-65.	85.	0.29	0.19	0.8	0.00	0.31	0.31	0.133	0.05	36195.	0.12	14651.	0.05	34239.	0.98	0.05	2.06
3664	-65.	87.	0.30	0.19	0.8	0.00	0.32	0.32	0.267	0.05	36195.	0.12	14651.	0.06	31106.	0.93	0.05	2.06
3666	-64.	83.	0.29	0.19	1.0	0.00	0.31	0.31	0.000	0.05	35733.	0.12	13731.	0.06	28863.	0.91	0.05	2.01
3668	-64.	87.	0.28	0.19	1.1	0.00	0.29	0.29	0.267	0.05	35733.	0.13	12774.	0.07	27062.	0.88	0.04	2.03
3670	-65.	89.	0.26	0.19	1.1	0.00	0.27	0.27	0.400	0.05	36072.	0.13	12774.	0.05	33425.	0.97	0.04	2.09
3672	-64.	86.	0.29	0.19	0.8	0.00	0.31	0.31	0.200	0.05	35733.	0.10	17572.	0.06	33096.	0.97	0.06	1.93
3674	-64.	86.	0.29	0.20	0.8	0.00	0.30	0.30	0.200	0.05	35613.	0.09	18520.	0.05	36091.	1.01	0.06	1.91
3676	-64.	87.	0.29	0.21	0.7	0.00	0.30	0.30	0.267	0.05	35613.	0.09	20288.	0.05	38730.	1.04	0.07	1.87
3678	-63.	89.	0.28	0.20	0.9	0.00	0.29	0.29	0.400	0.05	35272.	0.11	16126.	0.05	35433.	1.00	0.06	1.90
3680	-60.	98.	0.25	0.20	1.3	0.00	0.26	0.26	1.000	0.05	34234.	0.09	18389.	0.06	31398.	0.96	0.07	1.70

WELL NUMBER = 27
FIELD : CERRO PRIETO
RANGE : FROM 3630 TO 3680

TABLE 27-9'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.500
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.04
PHINC= 0.29
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 450.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3630	-72.	93.	0.27	0.13	10.3	0.00	0.29	0.29	0.667	0.05	23720.	0.26	3699.	0.61	1535.	0.28	0.01	1.94
3632	-72.	94.	0.26	0.17	6.8	0.00	0.27	0.27	0.733	0.05	23720.	0.16	6098.	0.34	2748.	0.37	0.02	1.89
3634	-72.	94.	0.26	0.16	6.6	0.00	0.28	0.28	0.733	0.05	23720.	0.18	5443.	0.34	2792.	0.37	0.02	1.90
3636	-72.	91.	0.29	0.14	5.4	0.00	0.31	0.31	0.533	0.05	23720.	0.16	6241.	0.37	2523.	0.35	0.02	1.88
3638	-72.	90.	0.30	0.14	5.2	0.00	0.33	0.33	0.467	0.05	23720.	0.02	58654.	0.39	2410.	0.34	99.00	99.00
3640	-72.	91.	0.31	0.15	45.2	0.00	0.34	0.34	0.533	0.05	23720.	1.17	797.	3.67	262.	0.11	0.00	2.01
3642	-70.	90.	0.33	0.13	5.1	0.00	0.36	0.36	0.467	0.05	23440.	0.09	11060.	0.49	1902.	0.31	0.04	1.70
3644	-69.	87.	0.32	0.13	5.1	0.00	0.35	0.35	0.267	0.05	23298.	0.09	11041.	0.46	2053.	0.32	0.04	1.66
3646	-68.	91.	0.29	0.18	3.5	0.00	0.31	0.31	0.533	0.05	23155.	0.09	11360.	0.24	4100.	0.45	0.04	1.62
3648	-66.	88.	0.30	0.20	1.6	0.00	0.32	0.32	0.333	0.05	22864.	0.09	11419.	0.11	8883.	0.65	0.04	1.54
3650	-64.	91.	0.30	0.20	0.8	0.00	0.32	0.32	0.533	0.05	22569.	0.08	13636.	0.06	19047.	0.93	0.05	1.43
3652	-64.	91.	0.30	0.19	0.8	0.00	0.32	0.32	0.533	0.05	22569.	0.06	16997.	0.06	19337.	0.93	0.06	1.35
3654	-63.	91.	0.29	0.18	1.1	0.00	0.31	0.31	0.533	0.05	22419.	0.09	12005.	0.07	14369.	0.82	0.04	1.43
3656	-64.	93.	0.29	0.20	1.2	0.00	0.30	0.30	0.667	0.05	22569.	0.09	11488.	0.07	14052.	0.81	0.04	1.47
3658	-65.	91.	0.28	0.20	1.3	0.00	0.29	0.29	0.533	0.05	22717.	0.08	13780.	0.07	14144.	0.81	0.05	1.46
3660	-65.	89.	0.28	0.19	0.9	0.00	0.29	0.29	0.400	0.05	22717.	0.06	16941.	0.06	19080.	0.92	0.06	1.39
3662	-65.	85.	0.29	0.19	0.8	0.00	0.31	0.31	0.133	0.05	22717.	0.07	14651.	0.05	20153.	0.95	0.05	1.44
3664	-65.	87.	0.30	0.19	0.8	0.00	0.32	0.32	0.267	0.05	22717.	0.07	14651.	0.06	18337.	0.91	0.05	1.44
3666	-64.	83.	0.29	0.19	1.0	0.00	0.31	0.31	0.000	0.05	22569.	0.08	13731.	0.06	17100.	0.88	0.05	1.42
3668	-64.	87.	0.28	0.19	1.1	0.00	0.29	0.29	0.267	0.05	22569.	0.08	12774.	0.07	16049.	0.86	0.05	1.45
3670	-65.	89.	0.26	0.19	1.1	0.00	0.27	0.27	0.400	0.05	22717.	0.08	12774.	0.05	19758.	0.94	0.05	1.48
3672	-64.	86.	0.29	0.19	0.8	0.00	0.31	0.31	0.200	0.05	22569.	0.06	17572.	0.06	19566.	0.94	0.07	1.34
3674	-64.	86.	0.29	0.20	0.8	0.00	0.30	0.30	0.200	0.05	22569.	0.06	18520.	0.05	21392.	0.98	0.07	1.32
3676	-64.	87.	0.29	0.21	0.7	0.00	0.30	0.30	0.267	0.05	22569.	0.05	20288.	0.05	22931.	1.01	0.08	1.28
3678	-63.	89.	0.28	0.20	0.9	0.00	0.29	0.29	0.400	0.05	22419.	0.07	16126.	0.05	21008.	0.97	0.06	1.34
3680	-60.	98.	0.25	0.20	1.3	0.00	0.26	0.26	1.000	0.05	21963.	0.06	18389.	0.06	18650.	0.93	0.07	1.19

WELL NUMBER = 27
FIELD : CERRO PRIETO
RANGE : FROM 3630 TO 3680

TABLE 27-10'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.500
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.04
PHINC= 0.29
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 500.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3630	-72.	93.	0.27	0.13	10.3	0.00	0.29	0.29	0.667	0.05	21338.	0.23	3699.	0.61	1381.	0.28	0.01	1.80
3632	-72.	94.	0.26	0.17	6.8	0.00	0.27	0.27	0.733	0.05	21338.	0.15	6098.	0.34	2468.	0.37	0.02	1.74
3634	-72.	94.	0.26	0.16	6.6	0.00	0.28	0.28	0.733	0.05	21338.	0.16	5443.	0.34	2507.	0.37	0.02	1.76
3636	-72.	91.	0.29	0.14	5.4	0.00	0.31	0.31	0.533	0.05	21338.	0.14	6241.	0.37	2267.	0.35	0.02	1.74
3638	-72.	90.	0.30	0.14	5.2	0.00	0.33	0.33	0.467	0.05	21338.	0.02	58654.	0.39	2166.	0.34	99.00	99.00
3640	-72.	91.	0.31	0.15	45.2	0.00	0.34	0.34	0.533	0.05	21338.	1.05	797.	3.67	237.	0.11	0.00	1.87
3642	-70.	90.	0.33	0.13	5.1	0.00	0.36	0.36	0.467	0.05	21106.	0.08	11060.	0.49	1710.	0.31	0.04	1.56
3644	-69.	87.	0.32	0.13	5.1	0.00	0.35	0.35	0.267	0.05	20989.	0.08	11041.	0.46	1845.	0.32	0.04	1.53
3646	-68.	91.	0.29	0.18	3.5	0.00	0.31	0.31	0.533	0.05	20870.	0.08	11360.	0.24	3677.	0.45	0.04	1.49
3648	-66.	88.	0.30	0.20	1.6	0.00	0.32	0.32	0.333	0.05	20630.	0.08	11419.	0.11	7944.	0.65	0.04	1.43
3650	-64.	91.	0.30	0.20	0.8	0.00	0.32	0.32	0.533	0.05	20386.	0.07	13636.	0.06	16988.	0.92	0.05	1.32
3652	-64.	91.	0.30	0.19	0.8	0.00	0.32	0.32	0.533	0.05	20386.	0.06	16997.	0.06	17246.	0.93	0.06	1.24
3654	-63.	91.	0.29	0.18	1.1	0.00	0.31	0.31	0.533	0.05	20262.	0.08	12005.	0.07	12828.	0.81	0.04	1.32
3656	-64.	93.	0.29	0.20	1.2	0.00	0.30	0.30	0.667	0.05	20386.	0.08	11488.	0.07	12546.	0.80	0.04	1.36
3658	-65.	91.	0.28	0.20	1.3	0.00	0.29	0.29	0.533	0.05	20508.	0.07	13780.	0.07	12628.	0.80	0.05	1.34
3660	-65.	89.	0.28	0.19	0.9	0.00	0.29	0.29	0.400	0.05	20508.	0.06	16941.	0.06	17018.	0.92	0.06	1.27
3662	-65.	85.	0.29	0.19	0.8	0.00	0.31	0.31	0.133	0.05	20508.	0.06	14651.	0.05	17972.	0.94	0.05	1.32
3664	-65.	87.	0.30	0.19	0.8	0.00	0.32	0.32	0.267	0.05	20508.	0.06	14651.	0.06	16357.	0.90	0.05	1.32
3666	-64.	83.	0.29	0.19	1.0	0.00	0.31	0.31	0.000	0.05	20386.	0.07	13731.	0.06	15257.	0.88	0.05	1.31
3668	-64.	87.	0.28	0.19	1.1	0.00	0.29	0.29	0.267	0.05	20386.	0.07	12774.	0.07	14322.	0.85	0.05	1.34
3670	-65.	89.	0.26	0.19	1.1	0.00	0.27	0.27	0.400	0.05	20508.	0.07	12774.	0.05	17620.	0.93	0.05	1.37
3672	-64.	86.	0.29	0.19	0.8	0.00	0.31	0.31	0.200	0.05	20386.	0.05	17572.	0.06	17450.	0.93	0.07	1.23
3674	-64.	86.	0.29	0.20	0.8	0.00	0.30	0.30	0.200	0.05	20386.	0.05	18520.	0.05	19072.	0.97	0.07	1.21
3676	-64.	87.	0.29	0.21	0.7	0.00	0.30	0.30	0.267	0.05	20386.	0.05	20288.	0.05	20440.	1.00	0.08	1.17
3678	-63.	89.	0.28	0.20	0.9	0.00	0.29	0.29	0.400	0.05	20262.	0.06	16126.	0.05	18731.	0.97	0.06	1.23
3680	-60.	98.	0.25	0.20	1.3	0.00	0.26	0.26	1.000	0.05	19884.	0.05	18389.	0.06	16635.	0.92	0.07	1.10

WELL NUMBER = 27
FIELD : CERRO PRIETO
RANGE : FROM 3630 TO 3680

TABLE 27-11
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.500
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.04
PHINC= 0.29
AN= 1.00
AM= 2.50
RWCLY= 0.10
TDEEP= 500.0
RSH= 1.50

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3630	-72.	93.	0.27	0.13	10.3	0.00	0.29	0.29	0.667	0.05	21338.	0.23	3699.	0.48	1774.	0.31	0.01	1.80
3632	-72.	94.	0.26	0.17	6.8	0.00	0.27	0.27	0.733	0.05	21338.	0.15	6098.	0.27	3229.	0.42	0.02	1.74
3634	-72.	94.	0.26	0.16	6.6	0.00	0.28	0.28	0.733	0.05	21338.	0.16	5443.	0.26	3277.	0.42	0.02	1.76
3636	-72.	91.	0.29	0.14	5.4	0.00	0.31	0.31	0.533	0.05	21338.	0.14	6241.	0.30	2881.	0.39	0.02	1.74
3638	-72.	90.	0.30	0.14	5.2	0.00	0.33	0.33	0.467	0.05	21338.	0.02	58654.	0.31	2731.	0.38	99.00	99.00
3640	-72.	91.	0.31	0.15	45.2	0.00	0.34	0.34	0.533	0.05	21338.	1.05	797.	2.95	292.	0.12	0.00	1.87
3642	-70.	90.	0.33	0.13	5.1	0.00	0.36	0.36	0.467	0.05	21106.	0.08	11060.	0.40	2106.	0.34	0.04	1.56
3644	-69.	87.	0.32	0.13	5.1	0.00	0.35	0.35	0.267	0.05	20989.	0.08	11041.	0.37	2289.	0.35	0.04	1.53
3646	-68.	91.	0.29	0.18	3.5	0.00	0.31	0.31	0.533	0.05	20870.	0.08	11360.	0.19	4712.	0.50	0.04	1.49
3648	-66.	88.	0.30	0.20	1.6	0.00	0.32	0.32	0.333	0.05	20630.	0.08	11419.	0.09	10185.	0.72	0.04	1.43
3650	-64.	91.	0.30	0.20	0.8	0.00	0.32	0.32	0.533	0.05	20386.	0.07	13636.	0.04	21909.	1.03	0.05	1.32
3652	-64.	91.	0.30	0.19	0.8	0.00	0.32	0.32	0.533	0.05	20386.	0.06	16997.	0.04	22219.	1.04	0.06	1.24
3654	-63.	91.	0.29	0.18	1.1	0.00	0.31	0.31	0.533	0.05	20262.	0.08	12005.	0.06	16606.	0.91	0.04	1.32
3656	-64.	93.	0.29	0.20	1.2	0.00	0.30	0.30	0.667	0.05	20386.	0.08	11488.	0.06	16275.	0.90	0.04	1.36
3658	-65.	91.	0.28	0.20	1.3	0.00	0.29	0.29	0.533	0.05	20508.	0.07	13780.	0.06	16523.	0.91	0.05	1.34
3660	-65.	89.	0.28	0.19	0.9	0.00	0.29	0.29	0.400	0.05	20508.	0.06	16941.	0.04	22294.	1.04	0.06	1.27
3662	-65.	85.	0.29	0.19	0.8	0.00	0.31	0.31	0.133	0.05	20508.	0.06	14651.	0.04	23353.	1.06	0.05	1.32
3664	-65.	87.	0.30	0.19	0.8	0.00	0.32	0.32	0.267	0.05	20508.	0.06	14651.	0.05	21065.	1.01	0.05	1.32
3666	-64.	83.	0.29	0.19	1.0	0.00	0.31	0.31	0.000	0.05	20386.	0.07	13731.	0.05	19800.	0.99	0.05	1.31
3668	-64.	87.	0.28	0.19	1.1	0.00	0.29	0.29	0.267	0.05	20386.	0.07	12774.	0.05	18737.	0.96	0.05	1.34
3670	-65.	89.	0.26	0.19	1.1	0.00	0.27	0.27	0.400	0.05	20508.	0.07	12774.	0.04	23515.	1.06	0.05	1.37
3672	-64.	86.	0.29	0.19	0.8	0.00	0.31	0.31	0.200	0.05	20386.	0.05	17572.	0.04	22670.	1.05	0.07	1.23
3674	-64.	86.	0.29	0.20	0.8	0.00	0.30	0.30	0.200	0.05	20386.	0.05	18520.	0.04	24823.	1.09	0.07	1.21
3676	-64.	87.	0.29	0.21	0.7	0.00	0.30	0.30	0.267	0.05	20386.	0.05	20288.	0.04	26649.	1.13	0.08	1.17
3678	-63.	89.	0.28	0.20	0.9	0.00	0.29	0.29	0.400	0.05	20262.	0.06	16126.	0.04	24587.	1.09	0.06	1.23
3680	-60.	98.	0.25	0.20	1.3	0.00	0.26	0.26	1.000	0.05	19884.	0.05	18389.	0.04	22436.	1.06	0.07	1.10

WELL NUMBER = 27
FIELD : CERRO PRIETO
RANGE : FROM 4174 TO 4194

TABLE 27-12'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.500
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.04
PHINC= 0.29
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 338.0
RSH= 4.00

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
4174	-60.	95.	0.25	0.21	2.7	0.00	0.26	0.26	0.286	0.05	28704.	0.12	11286.	0.12	11356.	0.66	0.04	1.64
4176	-62.	97.	0.23	0.15	1.2	0.00	0.24	0.24	0.571	0.05	29208.	0.07	20866.	0.05	33450.	1.06	0.08	1.52
4178	-64.	100.	0.22	0.16	1.3	0.00	0.23	0.23	1.000	0.05	29704.	0.08	17509.	0.05	33133.	1.05	0.06	1.68
4180	-65.	96.	0.22	0.14	1.2	0.00	0.23	0.23	0.429	0.05	29948.	0.07	20287.	0.04	36730.	1.10	0.07	1.66
4182	-65.	99.	0.25	0.16	1.2	0.00	0.26	0.26	0.857	0.05	29948.	0.08	16661.	0.06	25899.	0.94	0.06	1.74
4184	-66.	94.	0.24	0.16	1.2	0.00	0.25	0.25	0.143	0.05	30191.	0.08	16661.	0.05	29059.	0.98	0.06	1.79
4186	-65.	93.	0.26	0.16	1.2	0.00	0.28	0.28	0.000	0.05	29948.	0.08	16883.	0.06	24322.	0.91	0.06	1.74
4188	-65.	95.	0.25	0.16	1.2	0.00	0.26	0.26	0.286	0.05	29948.	0.08	17719.	0.06	25071.	0.92	0.06	1.72
4190	-63.	95.	0.23	0.16	1.5	0.00	0.24	0.24	0.286	0.05	29457.	0.09	15845.	0.06	25802.	0.94	0.06	1.67
4192	-61.	95.	0.19	0.16	1.1	0.00	0.19	0.19	0.286	0.05	28957.	0.08	17125.	0.03	63074.	1.41	0.06	1.55
4194	-55.	95.	0.16	0.16	3.3	0.00	0.16	0.16	0.286	0.05	27410.	0.12	10939.	0.05	31205.	1.06	0.04	1.45

WELL NUMBER = 27
FIELD : CERRO PRIETO
RANGE : FROM 4174 TO 4194

TABLE 27-13'

TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.500
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.04
PHINC= 0.29
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 450.0
RSH= 4.00

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
4174	-60.	95.	0.25	0.21	2.7	0.00	0.26	0.26	0.286	0.05	21963.	0.09	11286.	0.12	8379.	0.64	0.04	1.35
4176	-62.	97.	0.23	0.15	1.2	0.00	0.24	0.24	0.571	0.05	22268.	0.05	20866.	0.05	24436.	1.04	0.08	1.20
4178	-64.	100.	0.22	0.16	1.3	0.00	0.23	0.23	1.000	0.05	22569.	0.06	17509.	0.05	24206.	1.03	0.07	1.34
4180	-65.	96.	0.22	0.14	1.2	0.00	0.23	0.23	0.429	0.05	22717.	0.05	20287.	0.04	26809.	1.08	0.08	1.32
4182	-65.	99.	0.25	0.16	1.2	0.00	0.26	0.26	0.857	0.05	22717.	0.06	16661.	0.06	18964.	0.92	0.06	1.39
4184	-66.	94.	0.24	0.16	1.2	0.00	0.25	0.25	0.143	0.05	22864.	0.06	16661.	0.05	21255.	0.97	0.06	1.43
4186	-65.	93.	0.26	0.16	1.2	0.00	0.28	0.28	0.000	0.05	22717.	0.06	16883.	0.06	17819.	0.90	0.06	1.39
4188	-65.	95.	0.25	0.16	1.2	0.00	0.26	0.26	0.286	0.05	22717.	0.06	17719.	0.06	18363.	0.91	0.07	1.37
4190	-63.	95.	0.23	0.16	1.5	0.00	0.24	0.24	0.286	0.05	22419.	0.07	15845.	0.06	18893.	0.93	0.06	1.34
4192	-61.	95.	0.19	0.16	1.1	0.00	0.19	0.19	0.286	0.05	22116.	0.06	17125.	0.03	45813.	1.38	0.06	1.25
4194	-55.	95.	0.16	0.16	3.3	0.00	0.16	0.16	0.286	0.05	21178.	0.09	10939.	0.05	22810.	1.03	0.04	1.21

WELL NUMBER = 27
FIELD : CERRO PRIETO
RANGE : FROM 4174 TO 4194

TABLE 27-14'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.500
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.04
PHINC= 0.29
AN= 1.00
AM= 2.00
RWCLY= 0.10
TDEEP= 450.0
RSH= 4.00

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
4174	-60.	95.	0.25	0.21	2.7	0.00	0.26	0.26	0.286	0.05	21963.	0.09	11286.	0.18	5416.	0.52	0.04	1.35
4176	-62.	97.	0.23	0.15	1.2	0.00	0.24	0.24	0.571	0.05	22268.	0.05	20866.	0.07	15290.	0.84	0.08	1.20
4178	-64.	100.	0.22	0.16	1.3	0.00	0.23	0.23	1.000	0.05	22569.	0.06	17509.	0.07	14872.	0.83	0.07	1.34
4180	-65.	96.	0.22	0.14	1.2	0.00	0.23	0.23	0.429	0.05	22717.	0.05	20287.	0.06	16523.	0.87	0.08	1.32
4182	-65.	99.	0.25	0.16	1.2	0.00	0.26	0.26	0.857	0.05	22717.	0.06	16661.	0.08	12244.	0.75	0.06	1.39
4184	-66.	94.	0.24	0.16	1.2	0.00	0.25	0.25	0.143	0.05	22864.	0.06	16661.	0.08	13503.	0.79	0.06	1.43
4186	-65.	93.	0.26	0.16	1.2	0.00	0.28	0.28	0.000	0.05	22717.	0.06	16883.	0.09	11677.	0.74	0.06	1.39
4188	-65.	95.	0.25	0.16	1.2	0.00	0.26	0.26	0.286	0.05	22717.	0.06	17719.	0.09	11861.	0.74	0.07	1.37
4190	-63.	95.	0.23	0.16	1.5	0.00	0.24	0.24	0.286	0.05	22419.	0.07	15845.	0.09	11839.	0.75	0.06	1.34
4192	-61.	95.	0.19	0.16	1.1	0.00	0.19	0.19	0.286	0.05	22116.	0.06	17125.	0.04	26400.	1.08	0.06	1.25
4194	-55.	95.	0.16	0.16	3.3	0.00	0.16	0.16	0.286	0.05	21178.	0.09	10939.	0.08	12462.	0.79	0.04	1.21

DRILLING REPORT ON WELL M-29

LOCATION:

The calculation of the coordinates uses as origin the coordinates for the center of Unit No. 1 of the Cerro Prieto Geothermal Power Plant; coordinates are referred to the rehabilitation system of the Irrigation District of the Department of Hydraulic Resources.

X = -17.435.27 m (57 201.6')

Y = -1998.57 m (6556.9')

Rotary table elevation 3.36 m (11.0') above ground level.

The well is located approximately 210.5 m (690.6') to the northeast of well M-9 and 303.3 m (995.1') northwest of well M-34.

DRILLING 66.0 cm (26"Ø) HOLE

Started drilling at 21:00 h on April 3, 1968, drilling with 66.0 cm (26"Ø) bit to a depth of 9.64 mbgl (31.6').

cleaned hole and pulled bit and drill string out to the surface.

CEMENTING 55.9 cm (22"Ø) CASING

Prepared and ran in 55.9 cm (22"Ø), grade B, 95.07 kg/m (65.24 lb/ft) conductor casing equipped with a Baker brand centralizer down to a depth of 8.64 mbgl (28.3').

With equipment and personnel from the contractor company, cemented the conductor casing with 100 sacks of cement [4000 kg (8818.4 lb], portland Gallo well-type cement, by means of direct cementing. The cement came out to the surface.

After the cement had set, installed surface connections.

DRILLING 50.8 cm (20"Ø) HOLE

Ran in 38.1 cm (15"Ø) bit and drill string to 7.64 mbgl (25.1'), reached the top of the cement, drilled and continued drilling to a depth of 181.64 mbgl (595.9'), circulated at the bottom and pulled the drill string out to the surface.

Ran in 50.8 cm (20"Ø) hole opener with 38.1 cm (15"Ø) guide bit and drill string, reamed the hole to a depth of 181.64 mbgl (595.9').

Conditioned mud and hole, pulled bit and drill string out to the surface.

CEMENTING 40.6 cm (16"Ø) CASING

Prepared and ran in 40.6 cm (16"Ø) grade H-40, 96.72 kg/m (65 lb/ft) rtsc, 8 threads per inch casing down to a depth of 180.62 mbgl (592.6'). It was equipped with a guide shoe, float collar, 7 centralizers, and a hammer-lock stop ring.

With equipment and personnel from the Halliburton Company, cemented the 40.6 cm (16"Ø) casing with 600 sacks of portland Ga110 type V cement. The cement came out to the surface.

After the cement had set, removed surface connections, cut 55.9 cm (22"Ø) and 40.6 cm (16"Ø) casing at 0 m (0') and at 0.35 m (1.15') above the bottom of the cellar.

INSTALLING 40.6 cm (16"Ø) WELL-HEAD

With equipment and personnel from Timex, welded with inside and outside beads the 40.6 cm (16"Ø) F.I.P. series 600, 2000 API well-head to 7.6 cm (3"Ø) double threadable side outlet.

Installed 40.6 cm (16"Ø) Shaffer blowout preventer and surface connections.

HYDRAULIC TEST

Ran in 38.1 cm (15"Ø) bit followed by twelve 17.1 cm (6-3/4"Ø) drill collars and 11.4 cm (4-1/2"Ø) fh drill string to a depth of 169.64 mbgl (556.6'), where the top of the cement was reached.

Closed blowout preventer, applied pressure, and satisfactorily tested 40.6 cm (16"Ø) casing, cementing job, and surface connections with a pressure of 70 kg/cm^2 (1000 psig) for 15 min.

DRILLING 38.1 cm (15"Ø) HOLE

With 38.1 cm (15"Ø) bit and drill string, drilled through cement plug collar, and shoe, continued drilling to a depth of 1038.64 mbgl (3407.6').

TECHNICAL LOGS

With equipment and personnel from the Commission, obtained temperature logs T-1 and T-2 from 646.64 to 1036.64 mbgl (2121.5' to 3401.0') with bottom temperatures of 87.7° and 90°C (190.0° and 194°F), respectively.

DRILLING 38.1 cm (15"Ø) HOLE, CONTINUED

With 38.1 cm (15"Ø) bit and drill string, continued drilling from 1038.64 to 1054.64 mbgl (3407.6' to 3460.1') and pulled the drill string out to the surface.

THERMAL AND ELECTRICAL LOGS

With equipment and personnel from the Commission, obtained temperature logs T-3 from 646.64 to 1046.64 mbgl (2121.5' to 3433.8'), T-4, T-5, and T-6 from 496.64 to 1046.64 mbgl (1629.4' to 3433.8'), with maximum bottom temperatures of 103°, 130°, 136°, and 108°C (217.4°, 266°, 276.8°, and 226.4°F), respectively

Ran in 38.1 cm (15"Ø) bit and drill string to the bottom, conditioned mud and hole, pulled drill string out to the surface.

With equipment and personnel from the Pan Geo Atlas Company, obtained electrical log from 1057.9 to 182.9 mbrt (3470' to 600'); did not obtain calibration log due to a defect in the probe.

With equipment and personnel from the Commission, obtained temperature logs T-7 and T-8 from a depth of 496.64 to 1046.54 mbgl (1629.4' to 3433.5') and from 496.64 to 1049.64 mbgl (1629.4' to 3443.7'), with maximum bottom temperatures of 139° and 146°C (282.2° and 294.8°F), respectively.

Conditioned mud and hole; with equipment and personnel from the Pan Geo Atlas Company, obtained microlog and calibration log from 1057.9 to 182.9 mbrt (3470' to 600').

During the drilling the following inclinations were obtained:

Depth (mbgl)	Depth (ft)	Inclination (degrees)
291.64	956.8	0°30'
496.64	1629.4	0°30'
660.64	2167.4	1°0'
754.64	2475.8	0°15'
904.64	2967.9	0°15'
976.64	3204.2	0°15'

CEMENTING 29.9 cm (11-3/4"Ø) CASING

Prepared and ran in 29.9 cm (11-3/4"Ø) grade J-55, 69.9 kg/m (47 lb/ft) and N-80, 89.3 kg/m (60 lb/ft) buttress thread casing to a depth of 1040.70 mbgl (3414.3'). It was equipped with guide shoe and Larnik brand float collar, 19 centralizers, and 2 hammer-lock stop rings.

With equipment and personnel from the Halliburton Company, cemented the 29.9 cm (11-3/4"Ø) casing with 784 sacks of Victor class G special cement mixed with special high-temperature additives. The excess cement came out to the surface.

After the cement had set, released internal pressure, removed blowout preventer and cut 29.9 cm (11-3/4"Ø) casing 0.5 cm (1.64') below the 40.6 cm (16"Ø) well-head flange. Washed the annular space between 40.6 cm (16"Ø) and 29.9 cm (11-3/4"Ø) casing to a depth of 5.8 mbgl (19.0'), installed telescoping pipe from 34.0 cm (13-3/8"Ø) for a length of 5.0 m (16.4') with 40.6 cm (16"Ø) adapter flange to 30.5 cm (12"Ø), 30.5 cm (12"Ø) master valve, blowout preventer, and surface connections.

HYDRAULIC TEST

Ran in 27.0 cm (10-5/8"Ø) bit followed by six 17.2 cm (6-3/4"Ø) drill collars and 11.4 cm (4-1/2"Ø) drill string to a depth of 1028.31 mbgl (3373.6'), where the top of the cement was reached. Displaced the mud column by water, washing the well completely.

Closed blowout preventer, applied pressure, satisfactorily tested the 29.9 cm (11-3/4"Ø) casing, cementing job, and surface connections with a pressure of 56 kg/cm^2 (800 psig) for 30 min.

FIRINGS

With equipment and personnel from the Pan Geo Atlas Company, carried out firings with disintegrating guns in the interval from 829.94 to 918.34 mbgl (2722.9' to 3012.9') with 1376 detonating charges.

X-RAY LOG

With equipment and personnel from the Conam Inspection Company, obtained x-ray log of the 40.6 cm (16"Ø) well-head weld with satisfactory results.

Pulled drill string out to the surface, disconnecting pipe by pipe.

COMPLETION

The construction of this well was considered completed when the 30.5 cm (12"Ø) master valve was closed at 21:00 h on May 21, 1968.

PRODUCTIVE LIFE

INDUCING OPERATION

Started sounding with American Heist equipment, 75-liter cylindrical bailer on July 18, 1968; succeeding in inducing it, having bailed the water column November 18, 1968, through a 7.3 cm (2-7/8"Ø) line and regulated 5.1 cm (2"Ø) valve.

DEVELOPMENT AND PRODUCTIVE LIFE

Developed the well through 14.0, 14.6, 15.2, 15.9, and 16.5 cm (5-1/2", 5-3/4", 6", 6-1/4", and 6-1/2" Ø) orifices, later during the years 1969, 1970, 1971, and 1972, through 6.5, 7.6, and 10.2 (2", 3". and 4") orifices with pressures of 21.1 to 7.0 kg/cm^2 (300 to 100 psig).

In March 1973 the well was developed through 12.1, 17.8, and 22.9 cm (4-3/4", 7", and 9") cones flowing to the plant through a side line on March 12, 1973.

A decrease in the pressure was observed from January 1974; it died out on March 27, 1974, and the well had to wait for repair, probably due to encrustations.

Compiled

Raul Rivera Olguin

Reviewed:
(signed)
Engineer Rene de Leon Botello
SUPERINTENDENT OF WELL DRILLING

Approved;

Engineer Bernardo Dominguez Aguirre
GENERAL SUPERINTENDENT

SP-GAMMA RAY OVERLAYS WELL 29

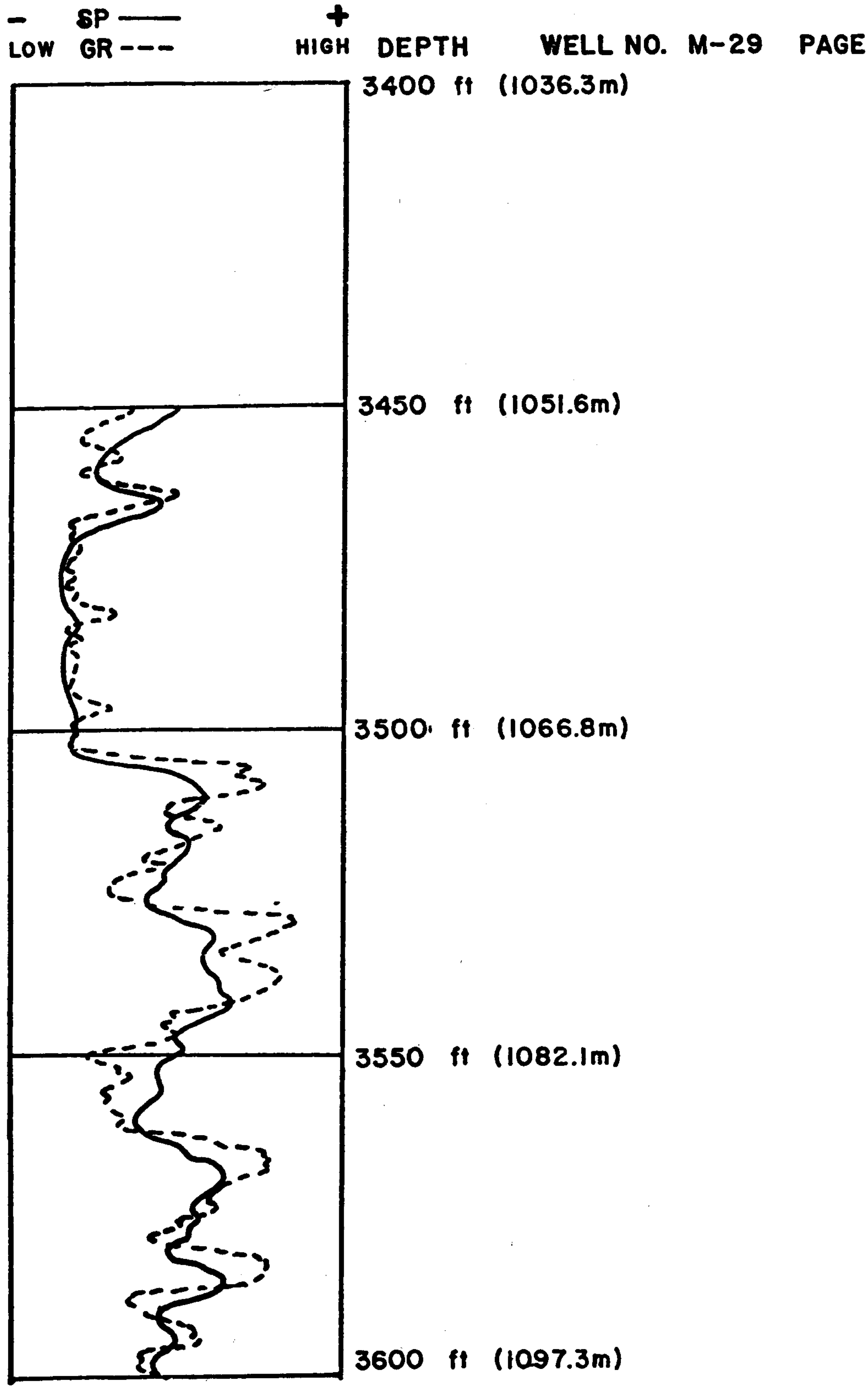

Fig. D-14. SP-Gamma Ray Overlay.

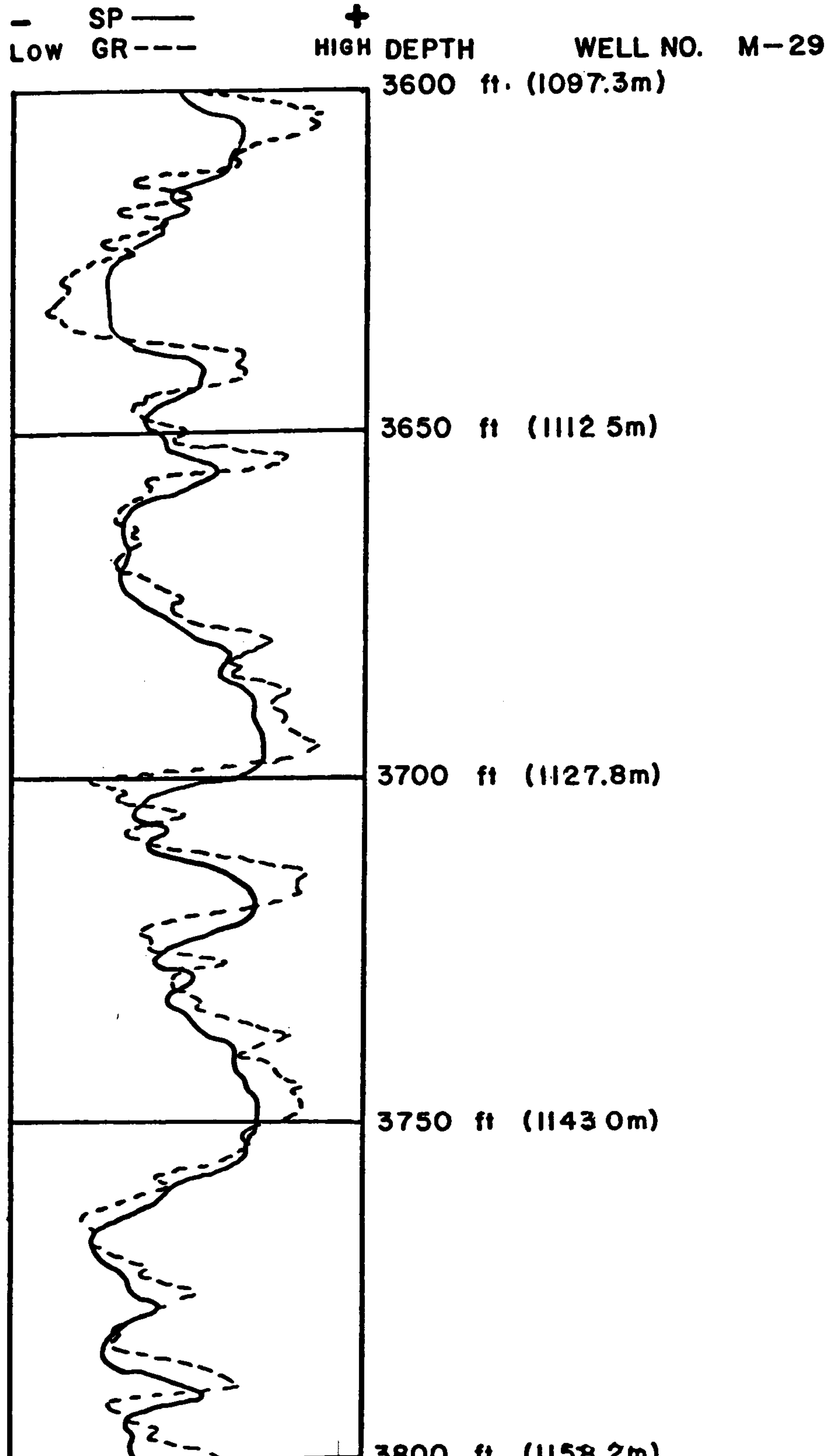

Fig. D-15. SP-Gamma Ray Overlay.

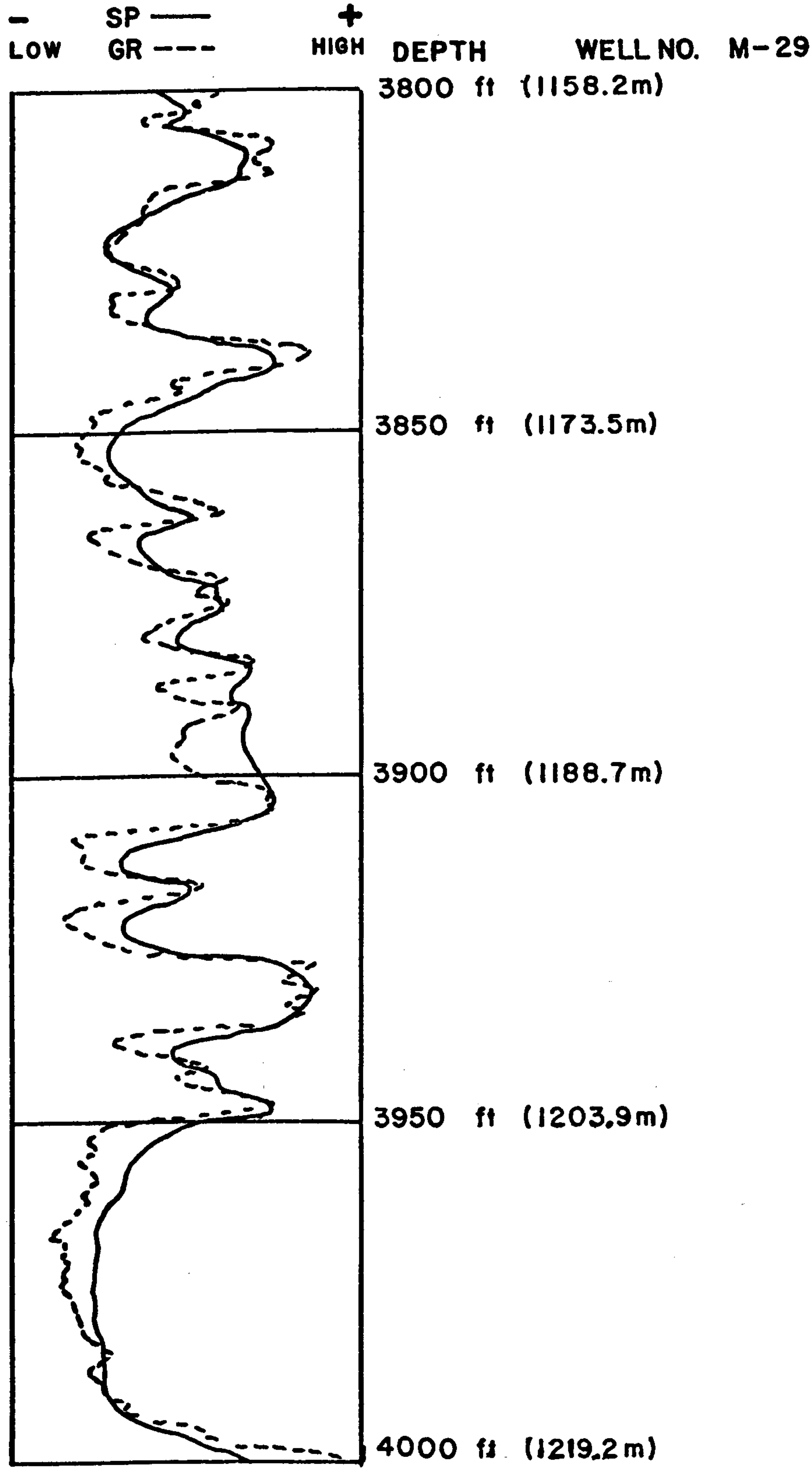

Fig. D-16. SP-Gamma Ray Overlay.

COMPUTED RESULTS WELL 29

WELL NUMBER = 29
FIELD : CERRO PRIETO
RANGE : FROM 3476 TO 3504

TABLE 29-1

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.05
PHINC= 0.35
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 205.0
RSH= 1.60

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3476	-60.	48.	0.30	0.35	1.2	0.17	0.29	0.32	0.043	0.05	55769.	0.05	47481.	0.08	29162.	0.72	0.10	1.91
3478	-59.	50.	0.20	0.27	1.3	0.23	0.19	0.22	0.130	0.05	55282.	0.04	59530.	0.04	73714.	1.03	0.13	1.70
3480	-58.	53.	0.22	0.27	1.4	0.17	0.21	0.24	0.261	0.05	54539.	0.04	77744.	0.05	53771.	0.93	0.19	1.41
3482	-57.	61.	0.19	0.32	0.6	0.43	0.17	0.23	0.609	0.05	54044.	0.04	75851.	0.02	189800.	1.45	0.19	1.37
3484	-55.	47.	0.23	0.27	1.3	0.13	0.22	0.24	0.000	0.05	53038.	0.04	74901.	0.05	55497.	0.97	0.19	1.26
3486	-58.	49.	0.23	0.28	1.0	0.17	0.22	0.25	0.087	0.05	54539.	0.06	44350.	0.04	68070.	1.04	0.09	1.81
3488	-59.	51.	0.23	0.29	1.3	0.20	0.22	0.25	0.174	0.05	54775.	0.07	37968.	0.05	51982.	0.91	0.08	1.94
3490	-59.	51.	0.22	0.28	1.3	0.20	0.21	0.24	0.174	0.05	54775.	0.08	30870.	0.05	54926.	0.93	0.06	2.02
3492	-58.	49.	0.21	0.25	1.5	0.13	0.20	0.22	0.087	0.05	54291.	0.07	35548.	0.04	58428.	0.98	0.07	1.90
3494	-58.	51.	0.22	0.26	0.7	0.13	0.21	0.23	0.174	0.05	54291.	0.04	64346.	0.02	137077.	1.43	0.14	1.57
3496	-57.	60.	0.22	0.32	1.1	0.33	0.20	0.25	0.565	0.05	53558.	0.06	44155.	0.04	60808.	0.93	0.09	1.74
3498	-55.	50.	0.22	0.30	1.3	0.27	0.21	0.25	0.130	0.05	52567.	0.04	61491.	0.05	53819.	0.91	0.14	1.41
3500	-57.	52.	0.25	0.27	1.5	0.07	0.25	0.26	0.217	0.05	53558.	0.04	69112.	0.06	38773.	0.85	0.16	1.44
3502	-57.	47.	0.24	0.27	1.6	0.10	0.24	0.25	0.000	0.05	53558.	0.04	70385.	0.07	38082.	0.83	0.17	1.43
3504	-58.	70.	0.20	0.27	1.5	0.23	0.19	0.22	1.000	0.05	53800.	0.04	57783.	0.04	58165.	0.94	0.13	1.63

WELL NUMBER = 29
FIELD : CERRO PRIETO
RANGE : FROM 3476 TO 3504

TABLE 29-2'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.05
PHINC= 0.35
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 350.0
RSH= 1.60

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3476	-60.	48.	0.30	0.35	1.2	0.17	0.29	0.32	0.043	0.04	32861.	0.03	47481.	0.08	16327.	0.69	0.11	1.26
3478	-59.	50.	0.20	0.27	1.3	0.23	0.19	0.22	0.130	0.04	32671.	0.03	59530.	0.04	40820.	1.00	0.15	1.07
3480	-58.	53.	0.22	0.27	1.4	0.17	0.21	0.24	0.261	0.04	32480.	0.02	77744.	0.05	29980.	0.91	0.27	0.76
3482	-57.	61.	0.19	0.32	0.6	0.43	0.17	0.23	0.609	0.05	32286.	0.02	75851.	0.02	104822.	1.41	0.26	0.74
3484	-55.	47.	0.23	0.27	1.3	0.13	0.22	0.24	0.000	0.05	31891.	0.02	74901.	0.05	30860.	0.94	0.28	0.66
3486	-58.	49.	0.23	0.28	1.0	0.17	0.22	0.25	0.087	0.04	32480.	0.03	44350.	0.04	37771.	1.01	0.10	1.22
3488	-59.	51.	0.23	0.29	1.3	0.20	0.22	0.25	0.174	0.04	32671.	0.04	37968.	0.05	29191.	0.88	0.08	1.34
3490	-59.	51.	0.22	0.28	1.3	0.20	0.21	0.24	0.174	0.04	32671.	0.05	30870.	0.05	30825.	0.90	0.06	1.42
3492	-58.	49.	0.21	0.25	1.5	0.13	0.20	0.22	0.087	0.04	32480.	0.04	35548.	0.04	32650.	0.95	0.08	1.33
3494	-58.	51.	0.22	0.26	0.7	0.13	0.21	0.23	0.174	0.04	32480.	0.02	64346.	0.02	75440.	1.39	0.18	0.96
3496	-57.	60.	0.22	0.32	1.1	0.33	0.20	0.25	0.565	0.05	32286.	0.03	44155.	0.04	34469.	0.90	0.10	1.18
3498	-55.	50.	0.22	0.30	1.3	0.27	0.21	0.25	0.130	0.05	31891.	0.03	61491.	0.05	30480.	0.88	0.18	0.88
3500	-57.	52.	0.25	0.27	1.5	0.07	0.25	0.26	0.217	0.05	32286.	0.02	69112.	0.06	21846.	0.82	0.21	0.85
3502	-57.	47.	0.24	0.27	1.6	0.10	0.24	0.25	0.000	0.05	32286.	0.02	70385.	0.06	21504.	0.80	0.22	0.83
3504	-58.	70.	0.20	0.27	1.5	0.23	0.19	0.22	1.000	0.04	32480.	0.03	57783.	0.04	33043.	0.91	0.15	1.05

WELL NUMBER = 29
FIELD : CERRO PRIETO
RANGE : FROM 3476 TO 3504

TABLE 29-3'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.05
PHINC= 0.35
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 450.0
RSH= 1.60

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3476	-60.	48.	0.30	0.35	1.2	0.17	0.29	0.35	0.043	0.04	25595.	0.02	47481.	0.11	9029.	0.69	0.12	1.00
3478	-59.	50.	0.20	0.27	1.3	0.23	0.19	0.28	0.130	0.04	25476.	0.02	59530.	0.06	18675.	0.99	0.18	0.81
3480	-58.	53.	0.22	0.27	1.4	0.17	0.21	0.27	0.261	0.04	25355.	0.02	77744.	0.07	15982.	0.90	99.00	99.00
3482	-57.	61.	0.19	0.32	0.6	0.43	0.17	0.33	0.609	0.04	25233.	0.02	75851.	0.03	36789.	1.39	99.00	99.00
3484	-55.	47.	0.23	0.27	1.3	0.13	0.22	0.27	0.000	0.04	24985.	0.02	74901.	0.06	17972.	0.93	99.00	99.00
3486	-58.	49.	0.23	0.28	1.0	0.17	0.22	0.28	0.087	0.04	25355.	0.03	44350.	0.05	20907.	1.00	0.11	0.98
3488	-59.	51.	0.23	0.29	1.3	0.20	0.22	0.30	0.174	0.04	25476.	0.03	37968.	0.07	14657.	0.87	0.09	1.09
3490	-59.	51.	0.22	0.28	1.3	0.20	0.21	0.29	0.174	0.04	25476.	0.04	30870.	0.07	15290.	0.89	0.07	1.18
3492	-58.	49.	0.21	0.25	1.5	0.13	0.20	0.25	0.087	0.04	25355.	0.03	35548.	0.06	18608.	0.94	0.08	1.09
3494	-58.	51.	0.22	0.26	0.7	0.13	0.21	0.26	0.174	0.04	25355.	0.02	64346.	0.03	45286.	1.37	0.22	0.69
3496	-57.	60.	0.22	0.32	1.1	0.33	0.20	0.33	0.565	0.04	25233.	0.03	44155.	0.08	12685.	0.89	0.11	0.95
3498	-55.	50.	0.22	0.30	1.3	0.27	0.21	0.31	0.130	0.04	24985.	0.02	61491.	0.08	12849.	0.87	0.21	0.63
3500	-57.	52.	0.25	0.27	1.5	0.07	0.25	0.27	0.217	0.04	25233.	0.02	69112.	0.07	14563.	0.81	0.28	0.56
3502	-57.	47.	0.24	0.27	1.6	0.10	0.24	0.27	0.000	0.04	25233.	0.02	70385.	0.08	13249.	0.79	0.30	0.53
3504	-58.	70.	0.20	0.27	1.5	0.23	0.19	0.28	1.000	0.04	25355.	0.02	57783.	0.07	14539.	0.90	0.17	0.80

WELL NUMBER = 29
FIELD : CERRO PRIETO
RANGE : FROM 3476 TO 3504

TABLE 29-4′
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.05
PHINC= 0.35
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 550.0
RSH= 1.60

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3476	-60.	48.	0.30	0.35	1.2	0.17	0.29	0.31	0.043	0.04	20946.	0.02	47481.	0.08	10205.	0.68	0.13	0.82
3478	-59.	50.	0.20	0.27	1.3	0.23	0.19	0.22	0.130	0.04	20865.	0.02	59530.	0.04	25412.	0.99	0.21	0.60
3480	-58.	53.	0.22	0.27	1.4	0.17	0.21	0.23	0.261	0.04	20783.	0.01	77744.	0.05	18610.	0.89	99.00	99.00
3482	-57.	61.	0.19	0.32	0.6	0.43	0.17	0.23	0.609	0.04	20699.	0.01	75851.	0.02	65367.	1.38	99.00	99.00
3484	-55.	47.	0.23	0.27	1.3	0.13	0.22	0.24	0.000	0.04	20531.	0.01	74901.	0.05	19070.	0.92	99.00	99.00
3486	-58.	49.	0.23	0.28	1.0	0.17	0.22	0.24	0.087	0.04	20783.	0.02	44350.	0.04	23331.	0.99	0.12	0.81
3488	-59.	51.	0.23	0.29	1.3	0.20	0.22	0.25	0.174	0.04	20865.	0.02	37963.	0.05	18176.	0.87	0.09	0.92
3490	-59.	51.	0.22	0.28	1.3	0.20	0.21	0.24	0.174	0.04	20865.	0.03	30870.	0.05	19190.	0.89	0.07	1.01
3492	-58.	49.	0.21	0.25	1.5	0.13	0.20	0.22	0.087	0.04	20783.	0.03	35548.	0.04	20181.	0.93	0.09	0.92
3494	-58.	51.	0.22	0.26	0.7	0.13	0.21	0.23	0.174	0.04	20783.	0.02	64346.	0.02	45965.	1.36	0.30	0.45
3496	-57.	60.	0.22	0.32	1.1	0.33	0.20	0.25	0.565	0.04	20699.	0.02	44155.	0.04	21695.	0.88	0.12	0.78
3498	-55.	50.	0.22	0.30	1.3	0.27	0.21	0.24	0.130	0.04	20531.	0.02	61491.	0.05	19109.	0.86	0.32	0.38
3500	-57.	52.	0.25	0.27	1.5	0.07	0.25	0.26	0.217	0.04	20699.	0.01	69112.	0.06	13480.	0.80	99.00	99.00
3502	-57.	47.	0.24	0.27	1.6	0.10	0.24	0.25	0.000	0.04	20699.	0.01	70385.	0.06	13322.	0.79	99.00	99.00
3504	-58.	70.	0.20	0.27	1.5	0.23	0.19	0.22	1.000	0.04	20783.	0.02	57783.	0.04	20659.	0.90	0.20	0.60

WELL NUMBER = 29
FIELD : CERRO PRIETO
RANGE : FROM 3764 TO 3798 TABLE 29-5'
COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.05
PHINC= 0.35
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 242.0
RSH= 1.60

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3764	-46.	52.	0.18	0.27	1.9	0.30	0.17	0.21	0.000	0.05	41991.	0.03	68594.	0.05	47430.	0.91	0.24	0.70
3766	-53.	54.	0.20	0.25	1.6	0.17	0.19	0.22	0.051	0.05	44866.	0.03	86361.	0.05	48522.	0.97	0.30	0.79
3768	-53.	54.	0.20	0.26	1.7	0.20	0.19	0.22	0.051	0.05	44695.	0.03	75401.	0.05	44347.	0.92	0.22	0.96
3770	-51.	60.	0.19	0.29	1.8	0.33	0.17	0.22	0.205	0.05	43900.	0.03	72981.	0.05	43131.	0.85	0.22	0.89
3772	-45.	69.	0.20	0.29	1.7	0.30	0.19	0.23	0.436	0.05	41417.	0.04	64144.	0.05	40085.	0.86	0.21	0.72
3774	-44.	71.	0.21	0.29	1.7	0.27	0.20	0.24	0.487	0.05	40939.	0.03	65549.	0.06	35787.	0.84	0.23	0.65
3776	-37.	84.	0.17	0.38	1.0	0.70	0.14	0.24	0.821	0.06	37779.	0.03	75256.	0.03	89019.	0.96	99.00	99.00
3778	-37.	73.	0.24	0.40	1.5	0.53	0.21	0.29	0.538	0.06	37779.	0.05	47926.	0.09	23282.	0.65	0.15	0.64
3780	-45.	63.	0.24	0.31	1.6	0.23	0.23	0.26	0.282	0.05	41269.	0.04	61899.	0.07	27931.	0.77	0.19	0.75
3782	-50.	61.	0.22	0.28	1.9	0.20	0.21	0.24	0.231	0.05	43334.	0.03	70563.	0.07	29606.	0.78	0.21	0.87
3784	-52.	61.	0.22	0.26	1.4	0.13	0.21	0.23	0.231	0.05	43966.	0.03	88281.	0.05	46505.	0.97	0.36	0.66
3786	-46.	81.	0.17	0.27	1.5	0.33	0.15	0.20	0.744	0.05	41541.	0.03	85259.	0.03	68112.	1.05	99.00	99.00
3788	-37.	88.	0.16	0.31	1.6	0.50	0.14	0.21	0.923	0.06	37657.	0.04	64229.	0.03	67923.	0.97	99.00	99.00
3790	-23.	91.	0.16	0.32	1.5	0.53	0.13	0.21	1.000	0.07	31195.	0.05	45396.	0.03	67303.	1.00	99.00	99.00
3792	-32.	58.	0.20	0.26	1.7	0.20	0.19	0.22	0.154	0.06	35288.	0.04	63572.	0.05	45482.	1.02	99.00	99.00
3794	-44.	62.	0.19	0.25	1.9	0.20	0.18	0.21	0.256	0.05	40560.	0.03	70563.	0.05	43168.	0.93	0.30	0.52
3796	-43.	72.	0.18	0.27	2.1	0.30	0.17	0.21	0.513	0.05	40138.	0.04	61452.	0.05	40874.	0.86	0.21	0.66
3798	-43.	72.	0.14	0.28	1.9	0.47	0.12	0.19	0.513	0.05	39999.	0.03	65077.	0.03	75275.	0.97	0.24	0.59

WELL NUMBER = 29
FIELD : CERRO PRIETO
RANGE : FROM 3764 TO 3798

TABLE 29-6'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.05
PHINC= 0.35
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 400.0
RSH= 1.60

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3764	-46.	52.	0.18	0.27	1.9	0.30	0.17	0.21	0.000	0.05	26545.	0.02	68594.	0.05	27693.	0.87	99.00	99.00
3766	-53.	54.	0.20	0.25	1.6	0.17	0.19	0.22	0.051	0.05	27706.	0.02	86361.	0.04	27992.	0.93	99.00	99.00
3768	-53.	54.	0.20	0.26	1.7	0.20	0.19	0.22	0.051	0.05	27706.	0.02	75401.	0.05	25802.	0.89	99.00	99.00
3770	-51.	60.	0.19	0.29	1.8	0.33	0.17	0.22	0.205	0.05	27383.	0.02	72981.	0.05	25385.	0.82	99.00	99.00
3772	-45.	69.	0.20	0.29	1.7	0.30	0.19	0.23	0.436	0.05	26372.	0.02	64144.	0.05	23544.	0.83	99.00	99.00
3774	-44.	71.	0.21	0.29	1.7	0.27	0.20	0.24	0.487	0.05	26198.	0.02	65549.	0.06	21000.	0.81	99.00	99.00
3776	-37.	84.	0.17	0.38	1.0	0.70	0.14	0.24	0.821	0.05	24931.	0.02	75256.	0.03	53226.	0.92	99.00	99.00
3778	-37.	73.	0.24	0.40	1.5	0.53	0.21	0.29	0.538	0.05	24931.	0.03	47926.	0.08	14119.	0.61	0.22	0.37
3780	-45.	63.	0.24	0.31	1.6	0.23	0.23	0.26	0.282	0.05	26372.	0.02	61899.	0.07	16471.	0.74	99.00	99.00
3782	-50.	61.	0.22	0.28	1.9	0.20	0.21	0.24	0.231	0.05	27219.	0.02	70563.	0.07	17419.	0.75	99.00	99.00
3784	-52.	61.	0.22	0.26	1.4	0.13	0.21	0.23	0.231	0.05	27546.	0.02	88281.	0.05	27121.	0.94	99.00	99.00
3786	-46.	81.	0.17	0.27	1.5	0.33	0.15	0.20	0.744	0.05	26545.	0.02	85259.	0.03	40134.	1.01	99.00	99.00
3788	-37.	88.	0.16	0.31	1.6	0.50	0.14	0.21	0.923	0.05	24931.	0.02	64229.	0.03	40607.	0.93	99.00	99.00
3790	-23.	91.	0.16	0.32	1.5	0.53	0.13	0.21	1.000	0.06	22178.	0.03	45396.	0.03	40352.	0.94	99.00	99.00
3792	-32.	58.	0.20	0.26	1.7	0.20	0.19	0.22	0.154	0.05	23979.	0.02	63572.	0.05	26799.	0.96	99.00	99.00
3794	-44.	62.	0.19	0.25	1.9	0.20	0.18	0.21	0.256	0.05	26198.	0.02	70563.	0.05	25480.	0.90	99.00	99.00
3796	-43.	72.	0.18	0.27	2.1	0.30	0.17	0.21	0.513	0.05	26022.	0.02	61452.	0.05	24369.	0.83	99.00	99.00
3798	-43.	72.	0.14	0.28	1.9	0.47	0.12	0.18	0.513	0.05	26022.	0.02	65077.	0.03	45378.	0.94	99.00	99.00

WELL NUMBER = 29
FIELD : CERRO PRIETO
RANGE : FROM 3952 TO 3994 TABLE 29-7'
COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.05
PHINC= 0.35
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 265.0
RSH= 1.60

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3952	-42.	54.	0.20	0.24	2.2	0.13	0.19	0.21	0.333	0.05	37166.	0.03	77684.	0.06	31707.	0.87	99.00	99.00
3954	-49.	55.	0.24	0.23	1.2	0.00	0.24	0.24	0.361	0.05	39570.	0.02	103408.	0.04	44286.	1.05	99.00	99.00
3956	-51.	50.	0.20	0.21	2.5	0.03	0.20	0.20	0.222	0.05	40260.	0.03	73159.	0.06	29110.	0.85	0.24	0.79
3958	-52.	54.	0.20	0.24	2.6	0.13	0.19	0.21	0.333	0.05	40600.	0.03	79645.	0.07	26021.	0.77	0.28	0.73
3960	-53.	51.	0.24	0.23	1.9	0.00	0.24	0.24	0.250	0.05	40936.	0.02	97348.	0.07	26275.	0.82	99.00	99.00
3962	-57.	51.	0.21	0.23	1.8	0.07	0.21	0.22	0.250	0.05	42091.	0.02	103064.	0.05	37426.	0.92	99.00	99.00
3964	-61.	48.	0.20	0.22	2.1	0.07	0.20	0.21	0.167	0.05	43329.	0.03	69181.	0.05	36006.	0.90	0.17	1.37
3966	-61.	42.	0.18	0.20	2.5	0.07	0.18	0.19	0.000	0.05	43329.	0.03	82956.	0.05	38003.	0.91	0.22	1.20
3968	-61.	46.	0.19	0.22	1.7	0.10	0.19	0.20	0.111	0.05	43329.	0.03	62817.	0.04	48679.	1.01	0.14	1.45
3970	-61.	45.	0.22	0.24	0.9	0.07	0.22	0.23	0.083	0.05	43170.	0.02	116953.	0.03	69365.	1.21	99.00	99.00
3972	-61.	45.	0.22	0.24	1.2	0.07	0.22	0.23	0.083	0.05	43170.	0.02	89499.	0.04	54592.	1.08	0.26	1.10
3974	-62.	44.	0.21	0.25	1.8	0.13	0.20	0.22	0.056	0.05	43468.	0.04	52183.	0.05	35560.	0.87	0.11	1.63
3976	-61.	47.	0.23	0.28	1.7	0.17	0.22	0.25	0.139	0.05	43170.	0.04	52912.	0.06	28808.	0.79	0.12	1.56
3978	-61.	49.	0.25	0.34	1.8	0.30	0.24	0.28	0.194	0.05	43012.	0.03	65295.	0.09	18920.	0.63	0.15	1.41
3980	-60.	49.	0.21	0.27	1.9	0.20	0.20	0.23	0.194	0.05	42713.	0.04	55351.	0.06	29706.	0.79	0.12	1.47
3982	-58.	54.	0.22	0.28	1.8	0.20	0.21	0.24	0.333	0.05	42102.	0.04	50270.	0.07	28089.	0.77	0.11	1.43
3984	-58.	59.	0.21	0.28	2.1	0.23	0.20	0.23	0.472	0.05	42102.	0.03	62837.	0.07	26031.	0.73	0.15	1.28
3986	-58.	52.	0.24	0.28	1.9	0.13	0.23	0.25	0.278	0.05	41951.	0.03	70108.	0.08	23324.	0.74	0.18	1.18
3988	-57.	54.	0.23	0.25	2.1	0.07	0.23	0.24	0.333	0.05	41642.	0.04	55000.	0.07	24657.	0.77	0.13	1.32
3990	-56.	58.	0.21	0.24	2.1	0.10	0.21	0.22	0.444	0.05	41329.	0.03	67767.	0.06	29513.	0.83	0.18	1.11
3992	-53.	64.	0.19	0.26	2.1	0.23	0.18	0.21	0.611	0.05	40229.	0.03	58774.	0.06	34081.	0.83	0.15	1.07
3994	-47.	78.	0.17	0.24	2.6	0.23	0.16	0.19	1.000	0.05	38225.	0.04	46964.	0.05	35364.	0.84	0.12	0.97

WELL NUMBER = 29
FIELD : CERRO PRIETO
RANGE : FROM 3952 TO 3994

TABLE 29-8′
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.05
PHINC= 0.35
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 400.0
RSH= 1.60

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3952	-42.	54.	0.20	0.24	2.2	0.13	0.19	0.21	0.333	0.05	25844.	0.02	77684.	0.06	20346.	0.84	99.00	99.00
3954	-49.	55.	0.24	0.23	1.2	0.00	0.24	0.24	0.361	0.05	27053.	0.01	103408.	0.04	28157.	1.02	99.00	99.00
3956	-51.	50.	0.20	0.21	2.5	0.03	0.20	0.20	0.222	0.05	27383.	0.02	73159.	0.06	18652.	0.83	99.00	99.00
3958	-52.	54.	0.20	0.24	2.6	0.13	0.19	0.21	0.333	0.05	27546.	0.02	79645.	0.07	16818.	0.75	99.00	99.00
3960	-53.	51.	0.24	0.23	1.9	0.00	0.24	0.24	0.250	0.05	27706.	0.01	97348.	0.07	16820.	0.80	99.00	99.00
3962	-57.	51.	0.21	0.23	1.8	0.07	0.21	0.22	0.250	0.04	28332.	0.01	103064.	0.05	24041.	0.90	99.00	99.00
3964	-61.	48.	0.20	0.22	2.1	0.07	0.20	0.21	0.167	0.04	28929.	0.02	69181.	0.05	23146.	0.88	0.21	0.87
3966	-61.	42.	0.18	0.20	2.5	0.07	0.18	0.19	0.000	0.04	28929.	0.02	82956.	0.05	24423.	0.90	0.34	0.62
3968	-61.	46.	0.19	0.22	1.7	0.10	0.19	0.20	0.111	0.04	28929.	0.02	62817.	0.04	31234.	0.99	0.17	0.96
3970	-61.	45.	0.22	0.24	0.9	0.07	0.22	0.23	0.083	0.04	28929.	0.01	116953.	0.03	44677.	1.19	99.00	99.00
3972	-61.	45.	0.22	0.24	1.2	0.07	0.22	0.23	0.083	0.04	28929.	0.02	89499.	0.04	35024.	1.06	99.00	99.00
3974	-62.	44.	0.21	0.25	1.8	0.13	0.20	0.22	0.056	0.04	29074.	0.03	52183.	0.05	23043.	0.85	0.13	1.14
3976	-61.	47.	0.23	0.28	1.7	0.17	0.22	0.25	0.139	0.04	28929.	0.03	52912.	0.06	18751.	0.77	0.13	1.09
3978	-61.	49.	0.25	0.34	1.8	0.30	0.24	0.28	0.194	0.04	28929.	0.02	65295.	0.09	12548.	0.62	0.19	0.93
3980	-60.	49.	0.21	0.27	1.9	0.20	0.20	0.23	0.194	0.04	28782.	0.02	55351.	0.06	19463.	0.77	0.14	1.02
3982	-58.	54.	0.22	0.28	1.8	0.20	0.21	0.24	0.333	0.04	28484.	0.03	50270.	0.07	18409.	0.76	0.13	1.01
3984	-58.	59.	0.21	0.28	2.1	0.23	0.20	0.23	0.472	0.04	28484.	0.02	62837.	0.07	17132.	0.72	0.19	0.84
3986	-58.	52.	0.24	0.28	1.9	0.13	0.23	0.25	0.278	0.04	28484.	0.02	70108.	0.08	15316.	0.72	0.24	0.73
3988	-57.	54.	0.23	0.25	2.1	0.07	0.23	0.24	0.333	0.04	28332.	0.02	55000.	0.07	16117.	0.76	0.15	0.92
3990	-56.	58.	0.21	0.24	2.1	0.10	0.21	0.22	0.444	0.04	28178.	0.02	67767.	0.06	19290.	0.81	0.23	0.69
3992	-53.	64.	0.19	0.26	2.1	0.23	0.18	0.21	0.611	0.05	27706.	0.02	58774.	0.05	22533.	0.81	0.19	0.72
3994	-47.	78.	0.17	0.24	2.6	0.23	0.16	0.19	1.000	0.05	26716.	0.03	46964.	0.05	23409.	0.82	0.14	0.70

WELL NUMBER = 29
FIELD : CERRO PRIETO
RANGE : FROM '3952 TO 3994

TABLE 29-9'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.500
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.05
PHINC= 0.35
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 400.0
RSH= 1.60

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3952	-42.	54.	0.20	0.24	2.2	0.13	0.19	0.21	0.333	0.06	20899.	0.03	43399.	0.06	20346.	0.92	99.00	99.00
3954	-49.	55.	0.24	0.23	1.2	0.00	0.24	0.24	0.361	0.05	22360.	0.02	57505.	0.04	28157.	1.11	99.00	99.00
3956	-51.	50.	0.20	0.21	2.5	0.03	0.20	0.20	0.222	0.05	22767.	0.03	40911.	0.06	18652.	0.90	99.00	99.00
3958	-52.	54.	0.20	0.24	2.6	0.13	0.19	0.21	0.333	0.05	22969.	0.03	44477.	0.07	16818.	0.81	99.00	99.00
3960	-53.	51.	0.24	0.23	1.9	0.00	0.24	0.24	0.250	0.05	23169.	0.02	54188.	0.07	16820.	0.87	99.00	99.00
3962	-57.	51.	0.21	0.23	1.8	0.07	0.21	0.22	0.250	0.05	23957.	0.02	57317.	0.05	24041.	0.97	99.00	99.00
3964	-61.	48.	0.20	0.22	2.1	0.07	0.20	0.21	0.167	0.05	24722.	0.03	38722.	0.05	23146.	0.94	0.21	0.87
3966	-61.	42.	0.18	0.20	2.5	0.07	0.18	0.19	0.000	0.05	24722.	0.03	46295.	0.05	24423.	0.96	0.34	0.62
3968	-61.	46.	0.19	0.22	1.7	0.10	0.19	0.20	0.111	0.05	24722.	0.04	35215.	0.04	31234.	1.06	0.17	0.96
3970	-61.	45.	0.22	0.24	0.9	0.07	0.22	0.23	0.083	0.05	24722.	0.02	64909.	0.03	44677.	1.27	99.00	99.00
3972	-61.	45.	0.22	0.24	1.2	0.07	0.22	0.23	0.083	0.05	24722.	0.03	49886.	0.04	35024.	1.14	99.00	99.00
3974	-62.	44.	0.21	0.25	1.8	0.13	0.20	0.22	0.056	0.05	24910.	0.04	29342.	0.05	23043.	0.91	0.13	1.14
3976	-61.	47.	0.23	0.28	1.7	0.17	0.22	0.25	0.139	0.05	24722.	0.04	29745.	0.06	18751.	0.82	0.13	1.09
3978	-61.	49.	0.25	0.34	1.8	0.30	0.24	0.28	0.194	0.05	24722.	0.04	36581.	0.09	12548.	0.66	0.19	0.93
3980	-60.	49.	0.21	0.27	1.9	0.20	0.20	0.23	0.194	0.05	24533.	0.04	31094.	0.06	19463.	0.82	0.14	1.02
3982	-58.	54.	0.22	0.28	1.8	0.20	0.21	0.24	0.333	0.05	24151.	0.04	28284.	0.07	18409.	0.81	0.13	1.01
3984	-58.	59.	0.21	0.28	2.1	0.23	0.20	0.23	0.472	0.05	24151.	0.04	35226.	0.07	17132.	0.77	0.19	0.84
3986	-58.	52.	0.24	0.28	1.9	0.13	0.23	0.25	0.273	0.05	24151.	0.03	39232.	0.08	15316.	0.77	0.24	0.73
3988	-57.	54.	0.23	0.25	2.1	0.07	0.23	0.24	0.333	0.05	23957.	0.04	30900.	0.07	16117.	0.81	0.15	0.92
3990	-56.	58.	0.21	0.24	2.1	0.10	0.21	0.22	0.444	0.05	23762.	0.03	37943.	0.06	19290.	0.87	0.23	0.69
3992	-53.	64.	0.19	0.26	2.1	0.23	0.18	0.21	0.611	0.05	23169.	0.04	32984.	0.05	22533.	0.87	0.19	0.72
3994	-47.	78.	0.17	0.24	2.6	0.23	0.16	0.19	1.000	0.06	21948.	0.05	26453.	0.05	23409.	0.88	0.14	0.70

WELL NUMBER = 29
FIELD : CERRO PRIETO
RANGE : FROM 3952 TO 3994 TABLE 29-10′
COMPUTED DATA IS AS BELOW: Rmf= 0.500
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.05
PHINC= 0.35
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 265.0
RSH= 1.60

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3952	-42.	54.	0.20	0.24	2.2	0.13	0.19	0.21	0.333	0.07	28728.	0.05	43399.	0.06	31707.	0.97	99.00	99.00
3954	-49.	55.	0.24	0.23	1.2	0.00	0.24	0.24	0.361	0.06	31528.	0.04	57505.	0.04	44286.	1.16	99.00	99.00
3956	-51.	50.	0.20	0.21	2.5	0.03	0.20	0.20	0.222	0.06	32337.	0.05	40911.	0.06	29110.	0.94	0.24	0.79
3958	-52.	54.	0.20	0.24	2.6	0.13	0.19	0.21	0.333	0.06	32738.	0.04	44477.	0.07	26021.	0.84	0.28	0.73
3960	-53.	51.	0.24	0.23	1.9	0.00	0.24	0.24	0.250	0.06	33138.	0.04	54188.	0.07	26275.	0.90	99.00	99.00
3962	-57.	51.	0.21	0.23	1.8	0.07	0.21	0.22	0.250	0.06	34599.	0.04	57317.	0.05	37426.	1.01	99.00	99.00
3964	-61.	48.	0.20	0.22	2.1	0.07	0.20	0.21	0.167	0.05	36124.	0.05	38722.	0.05	36006.	0.97	0.17	1.37
3966	-61.	42.	0.18	0.20	2.5	0.07	0.18	0.19	0.000	0.05	36124.	0.04	46295.	0.05	38003.	0.98	0.22	1.20
3968	-61.	46.	0.19	0.22	1.7	0.10	0.19	0.20	0.111	0.05	36124.	0.05	35215.	0.04	48679.	1.09	0.14	1.45
3970	-61.	45.	0.22	0.24	0.9	0.07	0.22	0.23	0.083	0.05	36001.	0.03	64909.	0.03	69865.	1.31	99.00	99.00
3972	-61.	45.	0.22	0.24	1.2	0.07	0.22	0.23	0.083	0.05	36001.	0.04	49886.	0.04	54592.	1.17	0.26	1.10
3974	-62.	44.	0.21	0.25	1.8	0.13	0.20	0.22	0.056	0.05	36373.	0.06	29342.	0.05	35560.	0.93	0.11	1.63
3976	-61.	47.	0.23	0.28	1.7	0.17	0.22	0.25	0.139	0.05	36001.	0.06	29745.	0.06	28808.	0.85	0.12	1.56
3978	-61.	49.	0.25	0.34	1.8	0.30	0.24	0.28	0.194	0.05	35878.	0.05	36581.	0.09	18920.	0.67	0.15	1.41
3980	-60.	49.	0.21	0.27	1.9	0.20	0.20	0.23	0.194	0.05	35506.	0.06	31094.	0.06	29706.	0.85	0.12	1.47
3982	-58.	54.	0.22	0.28	1.8	0.20	0.21	0.24	0.333	0.05	34752.	0.07	28284.	0.07	28089.	0.84	0.11	1.43
3984	-58.	59.	0.21	0.28	2.1	0.23	0.20	0.23	0.472	0.05	34752.	0.05	35226.	0.07	26031.	0.79	0.15	1.28
3986	-58.	52.	0.24	0.28	1.9	0.13	0.23	0.25	0.278	0.05	34637.	0.05	39232.	0.08	23324.	0.80	0.18	1.18
3988	-57.	54.	0.23	0.25	2.1	0.07	0.23	0.24	0.333	0.06	34259.	0.06	30900.	0.07	24657.	0.84	0.13	1.32
3990	-56.	58.	0.21	0.24	2.1	0.10	0.21	0.22	0.444	0.06	33878.	0.05	37943.	0.06	29513.	0.90	0.18	1.11
3992	-53.	64.	0.19	0.26	2.1	0.23	0.18	0.21	0.611	0.06	32618.	0.06	32984.	0.06	34081.	0.90	0.15	1.07
3994	-47.	78.	0.17	0.24	2.6	0.23	0.16	0.19	1.000	0.06	30264.	0.07	26453.	0.05	35364.	0.92	0.12	0.97

WELL NUMBER = 29
FIELD : CERRO PRIETO
RANGE : FROM 4070 TO 4096 TABLE 29-11′
COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.05
PHINC= 0.35
AN= 1.00
AM=. 2.30
RWCLY= 0.10
TDEEP= 282.0
RSH= 1.60

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
4070	-47.	58.	0.22	0.29	1.0	0.23	0.21	0.24	0.100	0.05	37004.	0.02	99025.	0.04	54920.	1.09	99.00	99.00
4072	-54.	67.	0.22	0.30	1.6	0.27	0.21	0.25	0.400	0.05	39187.	0.03	57727.	0.06	30751.	0.81	0.15	1.10
4074	-55.	74.	0.22	0.29	1.5	0.23	0.21	0.24	0.633	0.05	39486.	0.03	64649.	0.05	34612.	0.86	0.17	1.06
4076	-57.	59.	0.23	0.27	1.4	0.13	0.22	0.24	0.133	0.05	40073.	0.03	54950.	0.05	36250.	0.91	0.13	1.23
4078	-58.	62.	0.27	0.25	1.2	0.00	0.27	0.27	0.233	0.05	40222.	0.03	54826.	0.06	29546.	0.87	0.13	1.32
4080	-57.	70.	0.24	0.29	1.2	0.17	0.23	0.26	0.500	0.05	39936.	0.03	64979.	0.05	36507.	0.91	0.17	1.15
4082	-58.	68.	0.23	0.26	1.4	0.10	0.23	0.24	0.433	0.05	40222.	0.03	55457.	0.05	34737.	0.90	0.13	1.32
4084	-57.	66.	0.23	0.25	1.6	0.07	0.23	0.24	0.367	0.05	39936.	0.05	40542.	0.06	31501.	0.88	0.09	1.45
4086	-54.	71.	0.23	0.25	1.8	0.07	0.23	0.24	0.533	0.05	38925.	0.05	34614.	0.06	28210.	0.85	0.07	1.38
4088	-46.	72.	0.20	0.27	1.9	0.23	0.19	0.22	0.567	0.05	36448.	0.03	77506.	0.06	32426.	0.85	99.00	99.00
4090	-55.	57.	0.26	0.26	1.7	0.00	0.26	0.26	0.067	0.05	39220.	0.03	65250.	0.08	22525.	0.78	0.17	1.04
4092	-57.	55.	0.26	0.27	1.4	0.03	0.26	0.26	0.000	0.05	39800.	0.03	72761.	0.06	27809.	0.84	0.20	1.04
4094	-57.	62.	0.26	0.27	1.4	0.03	0.26	0.26	0.233	0.05	39665.	0.04	50957.	0.06	27190.	0.84	0.12	1.31
4096	-52.	85.	0.23	0.25	2.0	0.07	0.23	0.24	1.000	0.05	38199.	0.05	36599.	0.07	24190.	0.80	0.08	1.27

WELL NUMBER = 29
FIELD : CERRO PRIETO
RANGE : FROM 4070 TO 4096

TABLE 29-12'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.05
PHINC= 0.35
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 400.0
RSH= 1.60

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
4070	-47.	58.	0.22	0.29	1.0	0.23	0.21	0.24	0.100	0.05	26716.	0.01	99025.	0.03	37395.	1.06	99.00	99.00
4072	-54.	67.	0.22	0.30	1.6	0.27	0.21	0.25	0.400	0.05	27865.	0.02	57727.	0.06	21152.	0.79	0.17	0.77
4074	-55.	74.	0.22	0.29	1.5	0.23	0.21	0.24	0.633	0.04	28023.	0.02	64649.	0.05	23721.	0.85	0.22	0.70
4076	-57.	59.	0.23	0.27	1.4	0.13	0.22	0.24	0.133	0.04	28332.	0.02	54950.	0.05	24691.	0.89	0.15	0.92
4078	-58.	62.	0.27	0.25	1.2	0.00	0.27	0.27	0.233	0.04	28484.	0.02	54826.	0.06	20115.	0.86	0.15	0.95
4080	-57.	70.	0.24	0.29	1.2	0.17	0.23	0.26	0.500	0.04	28332.	0.02	64979.	0.05	24990.	0.89	0.20	0.77
4082	-58.	68.	0.23	0.26	1.4	0.10	0.23	0.24	0.433	0.04	28484.	0.02	55457.	0.05	23724.	0.89	0.15	0.95
4084	-57.	66.	0.23	0.25	1.6	0.07	0.23	0.24	0.367	0.04	28332.	0.03	40542.	0.06	21504.	0.86	0.09	1.10
4086	-54.	71.	0.23	0.25	1.8	0.07	0.23	0.24	0.533	0.05	27865.	0.04	34614.	0.06	19356.	0.83	0.08	1.08
4088	-46.	72.	0.20	0.27	1.9	0.23	0.19	0.22	0.567	0.05	26545.	0.02	77506.	0.05	22440.	0.83	99.00	99.00
4090	-55.	57.	0.26	0.26	1.7	0.00	0.26	0.26	0.067	0.04	28023.	0.02	65250.	0.08	15441.	0.76	0.22	0.69
4092	-57.	55.	0.26	0.27	1.4	0.03	0.26	0.26	0.000	0.04	28332.	0.02	72761.	0.06	19047.	0.83	0.27	0.63
4094	-57.	62.	0.26	0.27	1.4	0.03	0.26	0.26	0.233	0.04	28332.	0.03	50957.	0.06	18699.	0.82	0.13	0.97
4096	-52.	85.	0.23	0.25	2.0	0.07	0.23	0.24	1.000	0.05	27546.	0.04	36599.	0.07	16692.	0.78	0.09	0.99

WELL NUMBER = 29
FIELD : CERRO PRIETO
RANGE : FROM 4070 TO 4096

TABLE 29-13′
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.500
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.05
PHINC= 0.35
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 400.0
RSH= 1.60

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
4070	-47.	58.	0.22	0.29	1.0	0.23	0.21	0.24	0.100	0.06	21948.	0.02	55106.	0.03	37395.	1.15	99.00	99.00
4072	-54.	67.	0.22	0.30	1.6	0.27	0.21	0.25	0.400	0.05	23368.	0.04	3[illegible]406.	0.06	21152.	0.85	0.17	0.77
4074	-55.	74.	0.22	0.29	1.5	0.23	0.21	0.24	0.633	0.05	23566.	0.04	36225.	0.05	23721.	0.91	0.22	0.70
4076	-57.	59.	0.23	0.27	1.4	0.13	0.22	0.24	0.133	0.05	23957.	0.04	30872.	0.05	24691.	0.96	0.15	0.92
4078	-58.	62.	0.27	0.25	1.2	0.00	0.27	0.27	0.233	0.05	24151.	0.04	30804.	0.06	20115.	0.92	0.15	0.95
4080	-57.	70.	0.24	0.29	1.2	0.17	0.23	0.26	0.500	0.05	23957.	0.04	36407.	0.05	24990.	0.96	0.20	0.77
4082	-58.	68.	0.23	0.26	1.4	0.10	0.23	0.24	0.433	0.05	24151.	0.04	31152.	0.05	23724.	0.95	0.15	0.95
4084	-57.	66.	0.23	0.25	1.6	0.07	0.23	0.24	0.367	0.05	23957.	0.05	22891.	0.06	21504.	0.93	0.09	1.10
4086	-54.	71.	0.23	0.25	1.8	0.07	0.23	0.24	0.533	0.05	23368.	0.06	19595.	0.06	19356.	0.89	0.08	1.08
4088	-46.	72.	0.20	0.27	1.9	0.23	0.19	0.22	0.567	0.06	21740.	0.03	43301.	0.05	22440.	0.90	99.00	99.00
4090	-55.	57.	0.26	0.26	1.7	0.00	0.26	0.26	0.067	0.05	23566.	0.04	36557.	0.08	15441.	0.83	0.22	0.69
4092	-57.	55.	0.26	0.27	1.4	0.03	0.26	0.26	0.000	0.05	23957.	0.03	40692.	0.06	19047.	0.89	0.27	0.63
4094	-57.	62.	0.26	0.27	1.4	0.03	0.26	0.26	0.233	0.05	23957.	0.04	28664.	0.06	18699.	0.88	0.13	0.97
4096	-52.	85.	0.23	0.25	2.0	0.07	0.23	0.24	1.000	0.05	22969.	0.06	20700.	0.07	16692.	0.84	0.09	0.99

DRILLING REPORT ON WELL M-42

LOCATION:

The calculation of the coordinates uses as origin the coordinates for the center of Unit No. 1 of the Cerro Prieto Geothermal Power Plant; coordinates are referred to the rehabilitation system of the Irrigation District of the Department of Hydraulic Resources.

X = -17 176.02 m (56 351.1')

Y = -1156.14 m (3793.1')

Rotary table elevation 3.35 m (11.0') above ground level

Ground elevation (missing)

The well is located approximately 342.0 m (1122.0') northeast of well M-11 and 342.0 m (1122.0') northwest of well M-38.

DRILLING 50.8 cm (20"Ø) HOLE

Started drilling at 11:00 h on July 15, 1973, drilling with 37.5 cm (14-3/4"Ø) bit, four 16.5 cm (6-1/2"Ø) drill collars, and 11.4 cm (4-1/2"Ø) fh drill string, to a depth of 198.65 mbgl (651.7').

Circulated at the bottom, pulled bit and drill string out to the surface.

Inserted 50.8 cm (20"Ø) hole opener with 38.1 cm (15"Ø) guide bit and drill string; opened the hole up to a depth of 181.65 mbgl (596.0').

Conditioned mud and hole, pulled drill string out to the surface.

CEMENTING 40.6 cm (16"Ø) CASING

Prepared and ran in 40.6 cm (16"Ø), grade H-40 116.6 kg/m (75 lb/ft) and 96.7 kg/m (65 lb/ft) buttress thread casing to a depth of 176.98 mbgl (580.6'). The casing was equipped with a float shoe, float collar, and 15 centralizers.

With equipment and personnel from the Byron Jackson Company, cemented the 40.6 cm (16"Ø) casing with 34.6 m^3 (1221.9 ft^3) of cement grout modified with Diamix [36 700 kg (80 908.8 lb)], by displacement. The excess cement came out to the surface.

After the cement had set, removed cementing head and surface connections.

With equipment and personnel from the Perfesa Company, cut 40.6 cm (16"Ø) casing 1.67 m (5.48') above the floor of the cellar and welded 40.6 cm (16"Ø) well-head. Installed 40.6 cm (16"Ø) S-900 Shaffer blowout preventer and surface connections.

HYDRAULIC TEST

Ran in 38.1 cm (15"Ø) bit, eight 16.5 cm (6-1/2"Ø) drill collars, and 11.4 cm (4-1/2"Ø) fh drill string to a depth of 165.47 mbgl (542.9'), where the top of the cement was reached.

Closed blowout preventer, satisfactorily tested casing cementing job and surface connections with a pressure of 42 kg/cm^2 (600 psig) for 30 min.

DRILLING 38.1 cm (15"Ø) HOLE

With 38.1 cm (15"Ø) bit and drill string, drilled through collar, cement, and casing shoe; continued drilling in plastic sandy clay to 496.65 mbgl (1629.4'), where inclination log was taken with Kuster instrument, obtaining a reading of 0°10'.

Continued drilling to 732.95 mbgl (2404.7'). Increased the number of drill collars to a total of 10; continued drilling in plastic clay and shale to 796.65 mbgl (2613.6').

Conditioned mud and hole, pulled drill string out to the surface.

ELECTRICAL LOGS

With equipment and personnel from the Schlumberger Company, obtained induction log from 181.1 to 800.6 mbrt (594' to 2626') and micrelog from 181.1 to 800.0 mbrt (594' to 2624').

CEMENTING 29.9 cm (11-3/4"Ø) CASING

Prepared and ran in 29.9 cm (11-3/4"Ø) grade N-80 and K-55 89.3 kg/m (60 lb/ft) buttress thread casing to 792.65 mbgl (2600.5'). It was equipped with a float shoe, 1 float collar, and 42 centralizers.

With equipment and personnel from the Byron Jackson Company, cemented the 29.9 cm (11-3/4"Ø) casing with 49 000 kg (108 025.4 lb) modified with Diamix in the ratios 1"1 and 1"2, 37.4 and 14.3 m^3 (1320.7 and 505.0 ft^3) of grout. The cement came out to the surface.

After the cement had set, released pressure, removed cementing head, blowout preventer, and surface connections.

INSTALLING 29.9 cm (11-3/4"Ø) WELL-HEAD

With equipment and personnel from Timex, cut 40.6 cm (16"Ø) and 29.9 cm (11-3/4"Ø) casings 1.20 and 1.58 m (3.94' and 5.18'), respectively, above the floor of the cellar.

Welded 30.5 X 29.9 cm (12" X 11-3/4"Ø) S-900 well-head to the 29.9 cm (11-3/4"Ø) casing with inside and outside beads.

Installed 30.5 X 40.6 cm (12" X 16" Ø) adapter spool, blowout preventer, and surface connections.

HYDRAULIC TEST

Ran in 27.0 cm (10-5/8"Ø) bit, ten 16.5 cm (6-1/2"Ø) drill collars, and 11.4 cm (4-1/2"Ø) fh drill string to a depth of 741.65 mbgl (2433.2') where the top of the cement was reached.

Closed blowout preventer, satisfactorily tested 29.9 cm (11-3/4"Ø) casing, cementing job, and surface connections with a pressure of 70.4 kg/cm^2 (1000 psig) for 30 min.

DRILLING 27.0 cm (10-5/8"Ø) HOLE

With 27.0 cm (10-5/8"Ø) bit and drill string drilled through cement plug, collar, and casing shoe; continued drilling in plastic sandy clay to 696.0 mbgl (2283.4'). Continued drilling in clay, shale, and sandstone to 1016.65 mbgl (3335.4'). Partial losses of mud occurred at this depth, and the mud was therefore prepared with sealing material. Drilled with partial losses to 1326.65 mbgl (4352.5'), where the losses were minimized.

Removed sealing material, conditioned mud and hole, pulled drill string out to the surface.

The chemical material used in drilling the section 1016.65 to 1326.65 mbgl (3335.4' to 4352.5') to control the loss was as follows:

Depth (mbgl)	Chemical Material Used	
1016.65 to 1326.65 (3335.4' to 4352.5')	Milgel	387 sacks
	Milflo	43 "
	Unical	37 "
	Milcon	3 "
	Soda C.	29 "
	Cello Flake	13 "
	Nut	
	Mil Flake	10 "
	Waste	30 kg (66.1 lb)
	Diesel	9400 liters (2483.3 gal)

THERMAL LOGS

With equipment and personnel from the Federal Electricity Commission, obtained temperature log from 196.65 to 1321.65 mbgl (645.2' to 4336.1'); maximum bottom temperature 173°C (343.4°F).

Ran in bit and drill string to the bottom of the well; added 70 blocks of ice [875 kg (1929.0 lb)] to the mud in the pits, refrigerated the mud column in the well and pulled drill string out to the surface.

ELECTRICAL LOG

With equipment and personnel from the Schlumberger Company, obtained dual-induction laterolog from 793.9 to 1326.8 mbrt (2604' to 4352'), density log from 793.9 to 1328.7 mbrt (2604' to 4358'), and neutron log from 793.9 to 1328.7 mbrt (2604' to 4358').

CEMENTING 19.4 cm (7-5/8"Ø) CASING

Prepared and ran in 19.4 cm (7-5/8"Ø) grade J-55, 39.3 kg/m (26.4 lb/ft) buttress thread, smooth and slotted casing to 1310.71 mbgl (4300.2'), equipped with J collar, float collar, cementing collar, blank collar, blank casing shoe, 4 canvas metal petal baskets, and the centralizers necessary for good cementing.

With equipment and personnel from the Byron Jackson Company, cemented the 19.4 cm (7-5/8"Ø) casing in two stages. In the first stage cemented with 3.440 m^3 (121.5 ft^3) of cement grout, type G modified with Diamix; opened J collar, checked circulation, and carried out the second stage of cementing with 32.150 m^3 (1135.3 ft^3) of cement, type G, modified with Diamix.

While the cement was setting, released pressure on various occasions; after the cement had set, removed cementing head, blowout preventer, and surface connections.

Cut 19.4 cm (7-5/8"Ø) casing 0.20 m (0.66') above the 29.9 cm (11-3/4"Ø) well-head, installed blowout preventer and surface connections.

HYDRAULIC TEST

Ran in 16.5 cm (6-1/2"Ø) bit and drill string to 867.85 mbgl (2847.2') where the top of the cement was reached.

Closed blowout preventer, satisfactorily tested the casing, cementing job, and surface connections with a pressure of 63.4 kg/cm^2 (900 psig) for 30 min.

Drilled through J cement collar at 878.39 mbgl (2881.8'), through float collar at 957.67 mbgl (3141.9'), cementing collar at 971.55 mbgl (3187.5'), and reached blank collar at 985.73 mbgl (3234.0').

Closed blowout preventer, satisfactorily tested the second stage of cementing and casing with a pressure of 63.4 kg/cm^2 (900 psig) for 30 min.

Pulled bit and drill string out, disconnecting pipe by pipe at the surface, observing that the bit was incomplete, one roll remaining in the well.

Hardened 16.5 cm (6-1/2"Ø) bit with tungsten weld, ran it in with 11.4 cm (4-1/2"Ø) drill string to 985.7 mbgl (3233.9'), drilled through blank collar, running it freely to a depth of 1001.75 mbgl (3286.5').

COMPLETION

Pulled bit and drill string out to the surface, disconnecting pipe by pipe; removed blowout preventer and surface connections.

Installed 30.5 X 20.3 cm (12" X 8") expansion spool, 20.3 cm (8"Ø) master valve, and surface connections.

Ran in 16.5 cm (6-1/2"Ø) bit with 7.3 cm (2-7/8"Ø) drill string, redrilled to a depth of 1310.65 mbgl (4300.0'), circulated at the bottom, displaced mud by water until it circulated completely clean at the surface.

Pulled bit and drill string out to the surface, disconnecting pipe by pipe, removed blowout preventer and surface connections.

Welded blank cover with 5.1 cm (2"Ø) outlet over the 20.3 cm (8"Ø) valve.

Closed 20.3 cm (8"Ø) master valve. Considered the construction of this well completed at 7:00 h on August 26, 1973.

Compiled
(signed)
Raul Rivera Olguin

Reviewed
(signed)
Engineer Rene de Leon Botello
SUPERINTENDENT OF WELL DRILLING

Approved
(signed)

Engineer Bernardo Dominguez A.
GENERAL SUPERINTENDENT

SP-GAMMA RAY OVERLAYS WELL 42

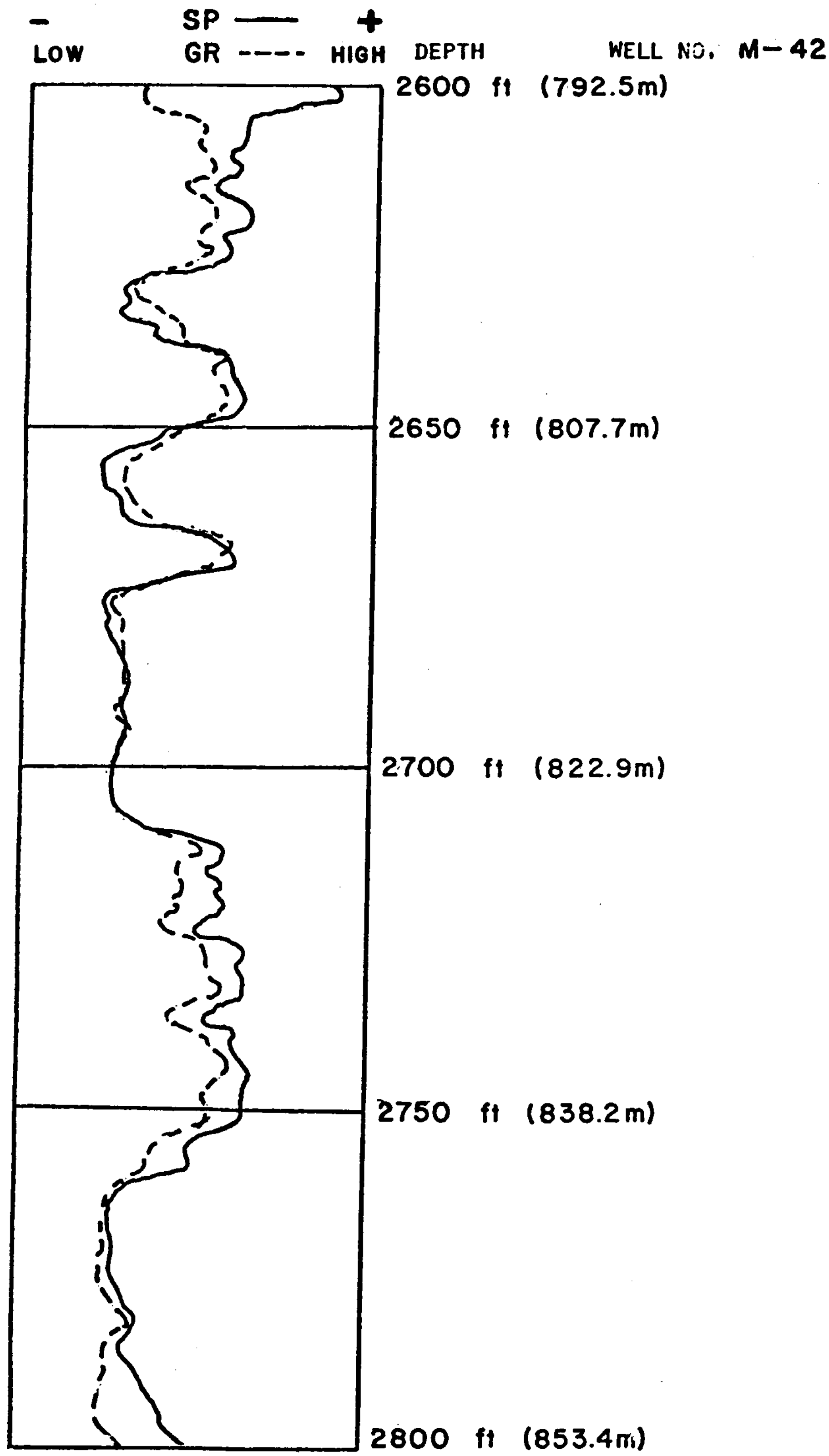

Fig. D-17. SP-Gamma Ray Overlay.

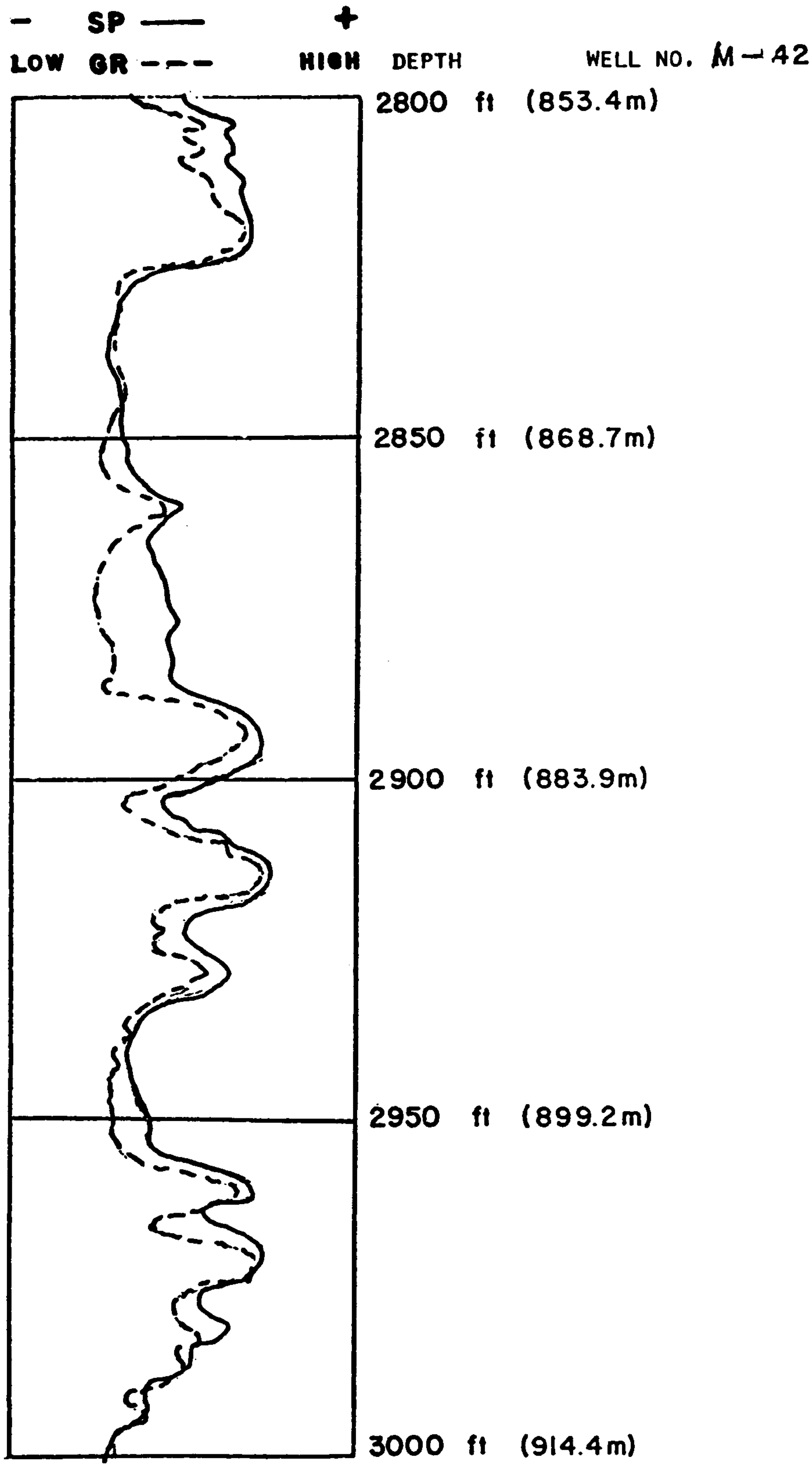

Fig. D-18. SP-Gamma Ray Overlay.

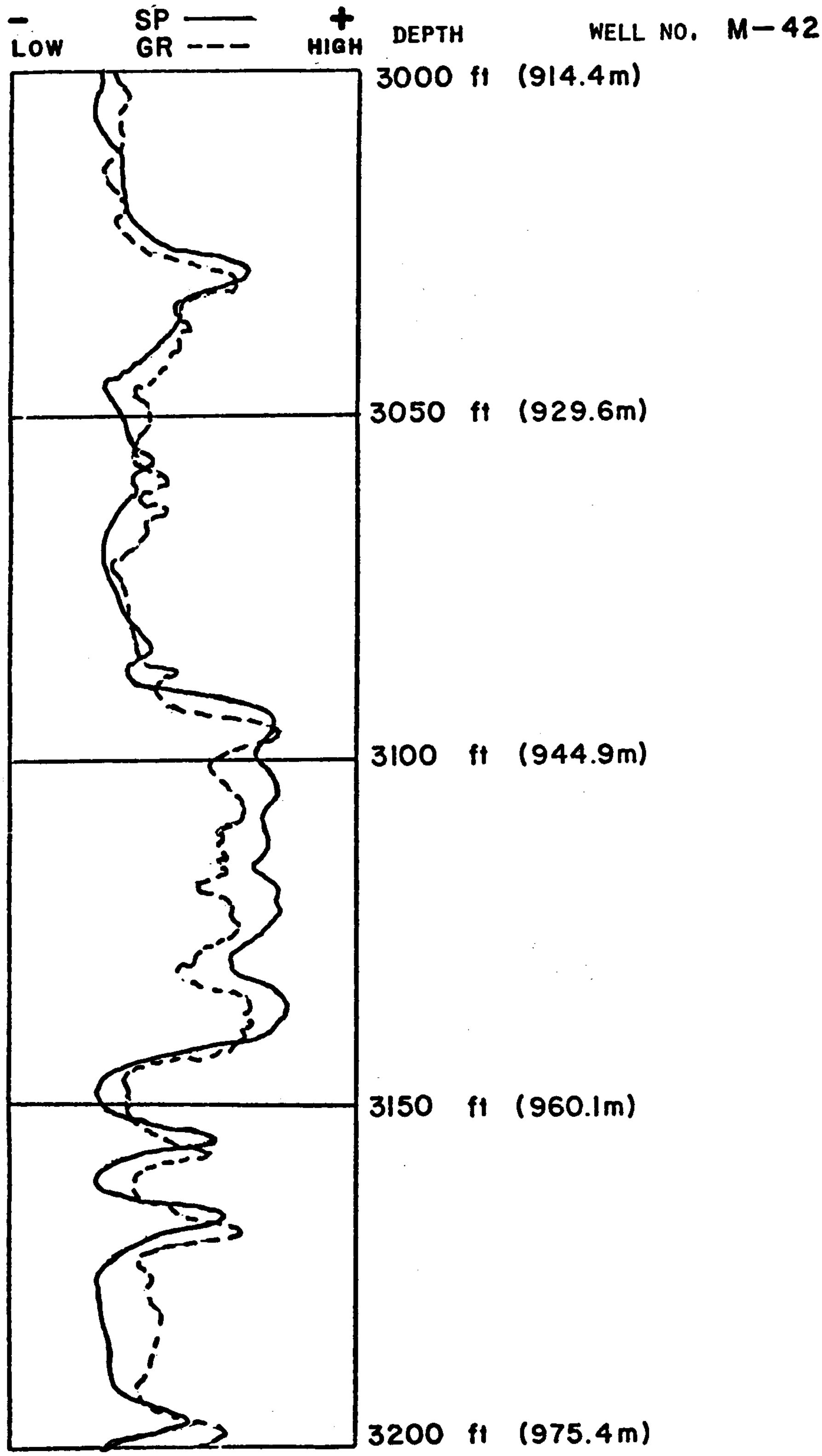

Fig. D-19. SP-Gammay Ray Overlay.

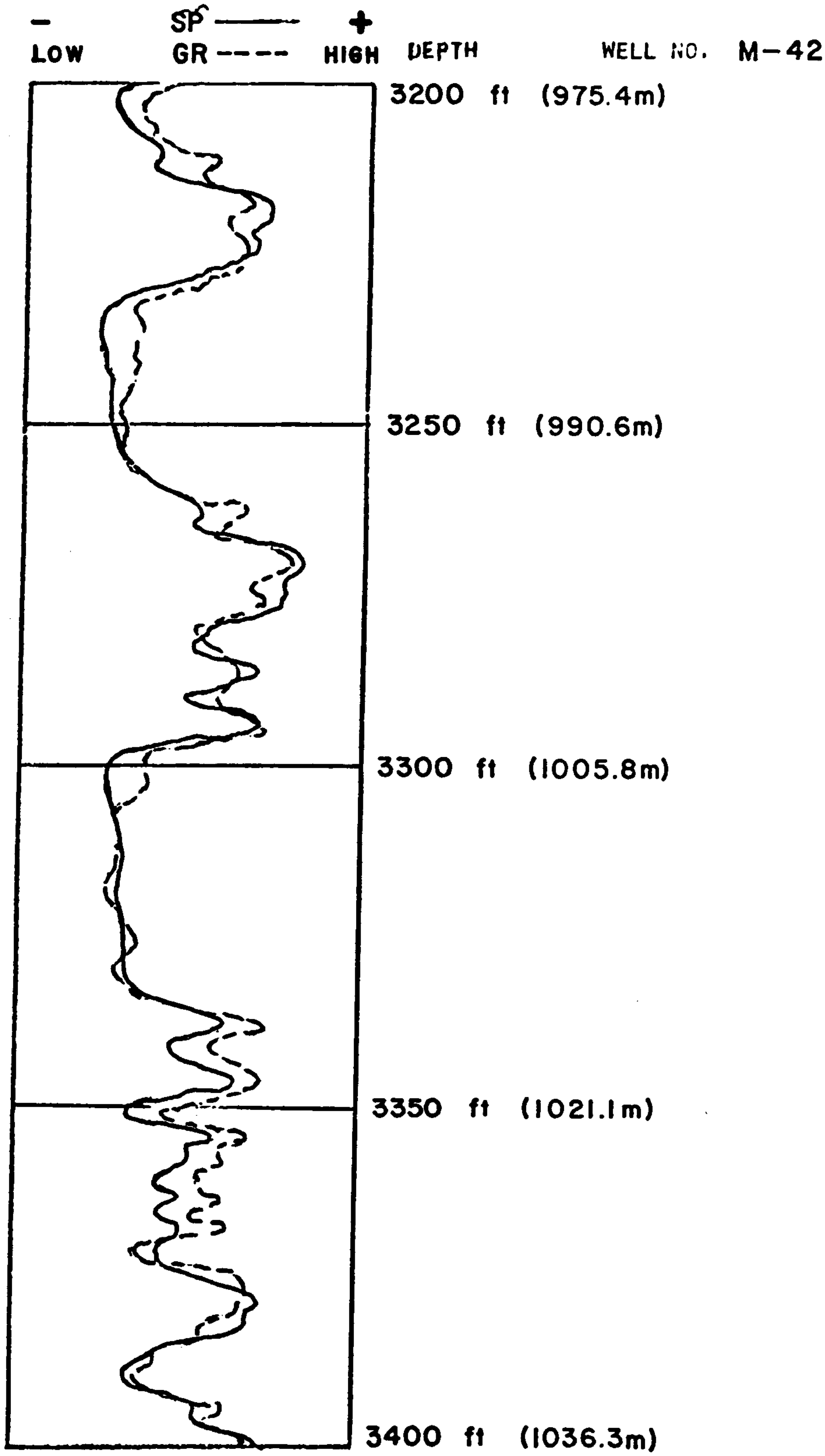

Fig. D-20. SP-Gamma Ray Overlay.

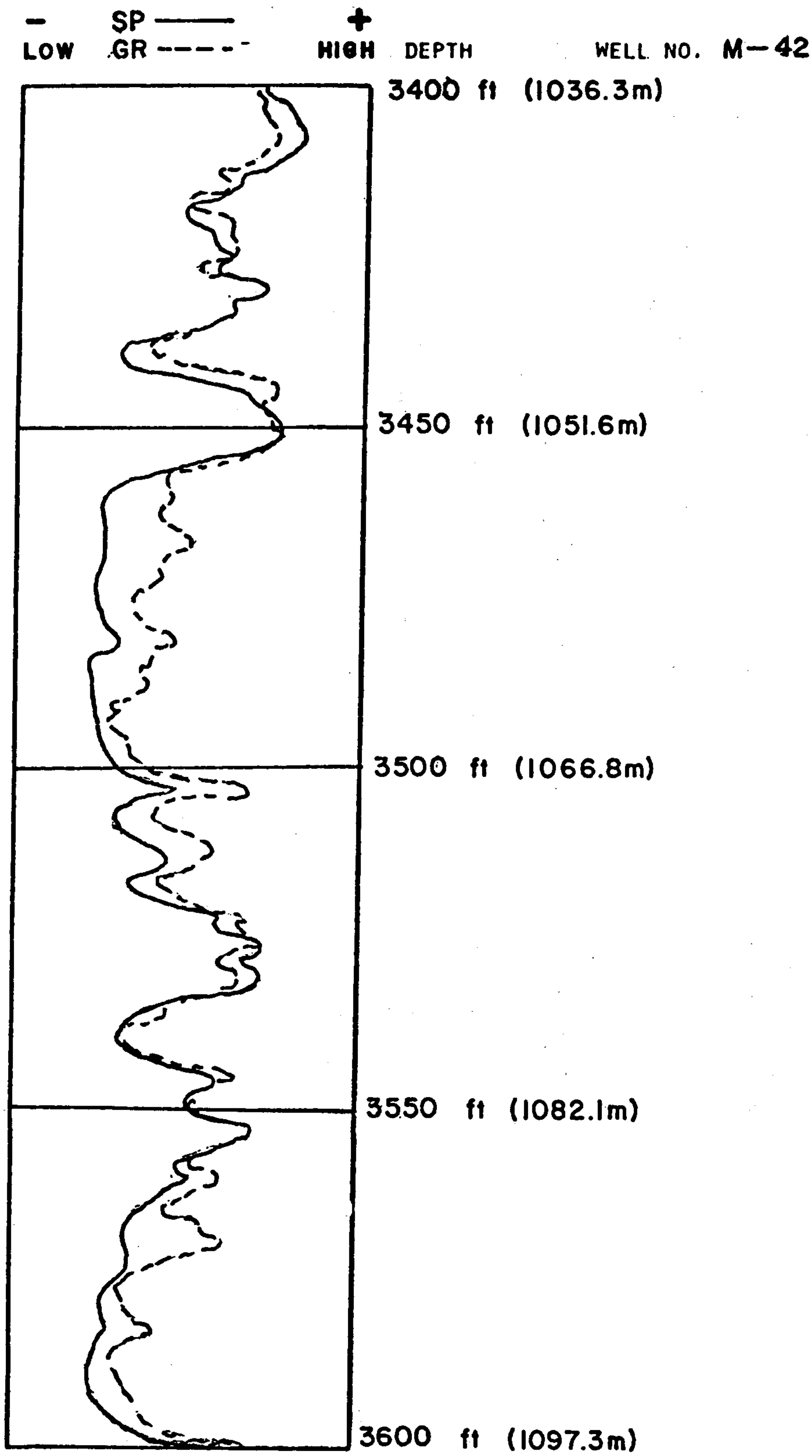

Fig. D-21. SP-Gamma Ray Overlay.

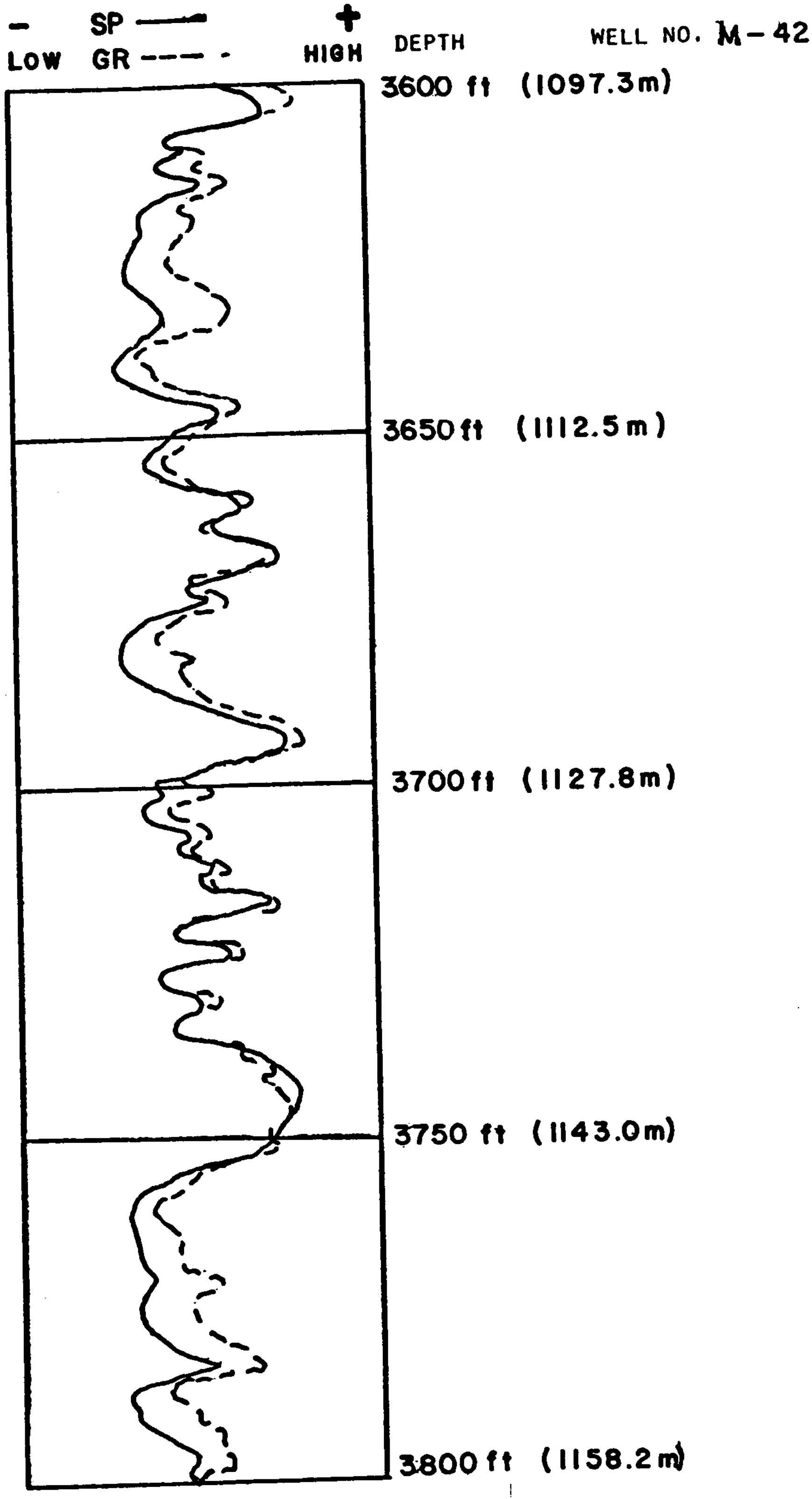

Fig. D-22. SP-Gamma Ray Overlay.

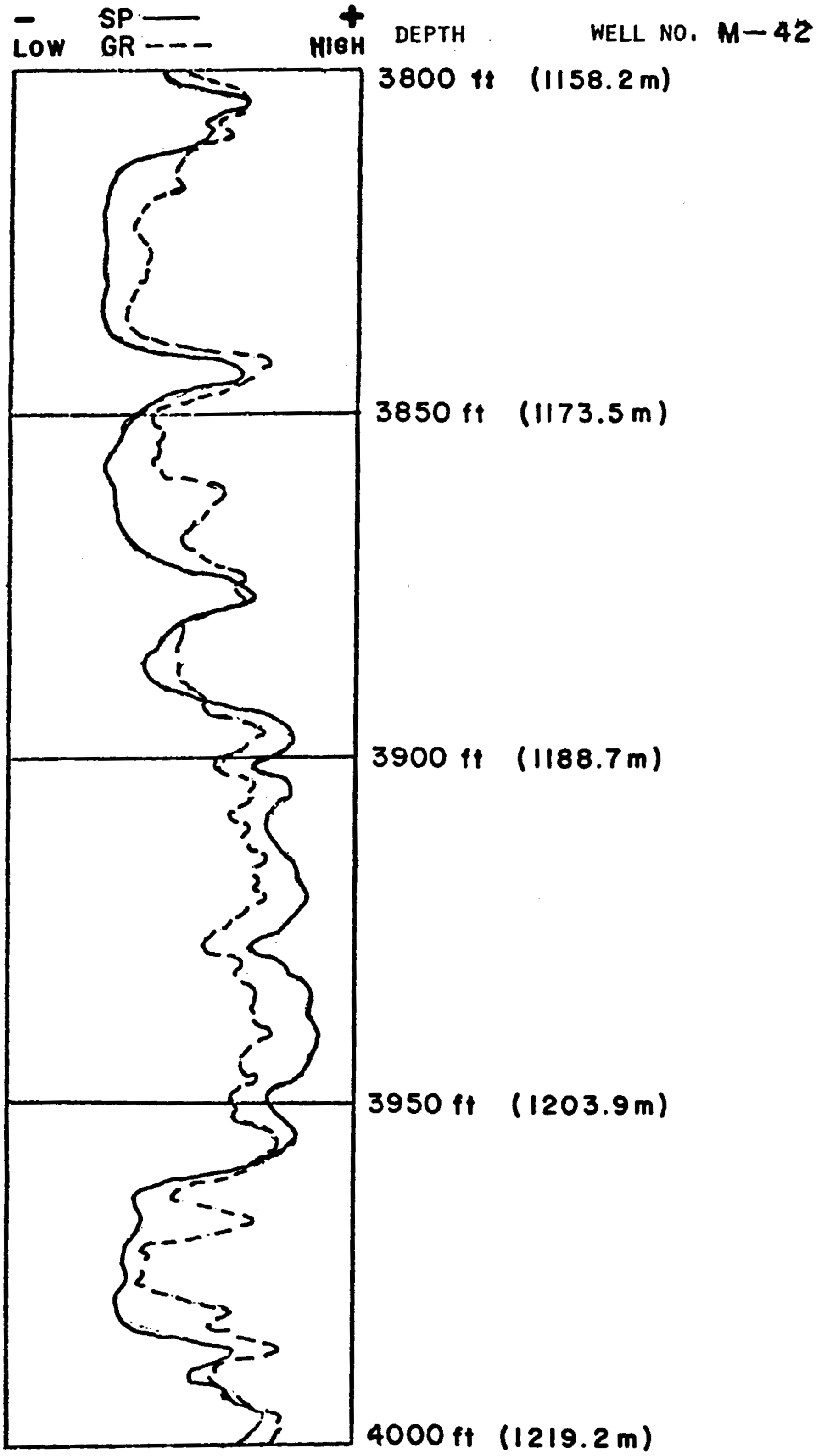

Fig. D-23. SP-Gamma Ray Overlay.

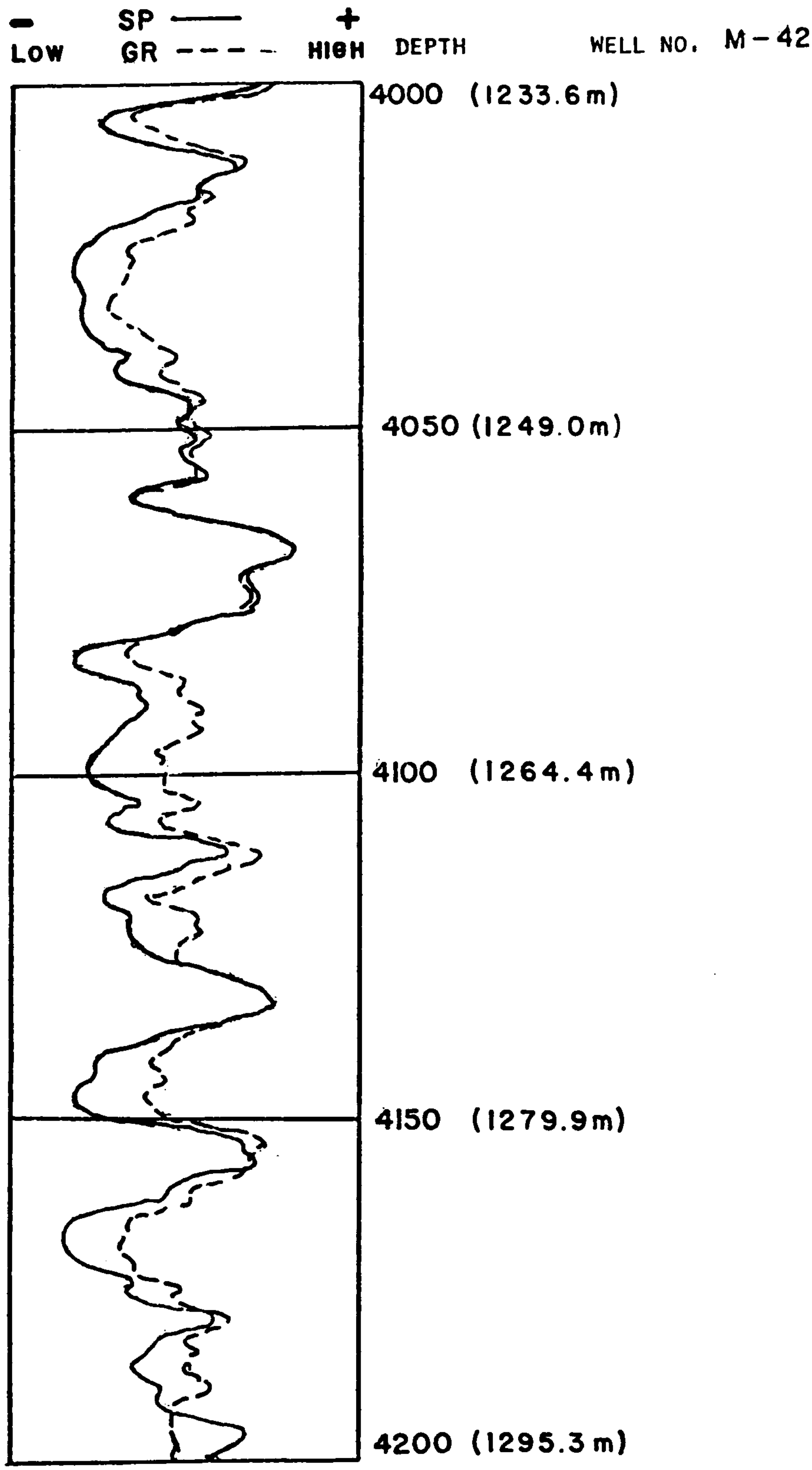

Fig. D-24. SP-Gamma Ray Overlay.

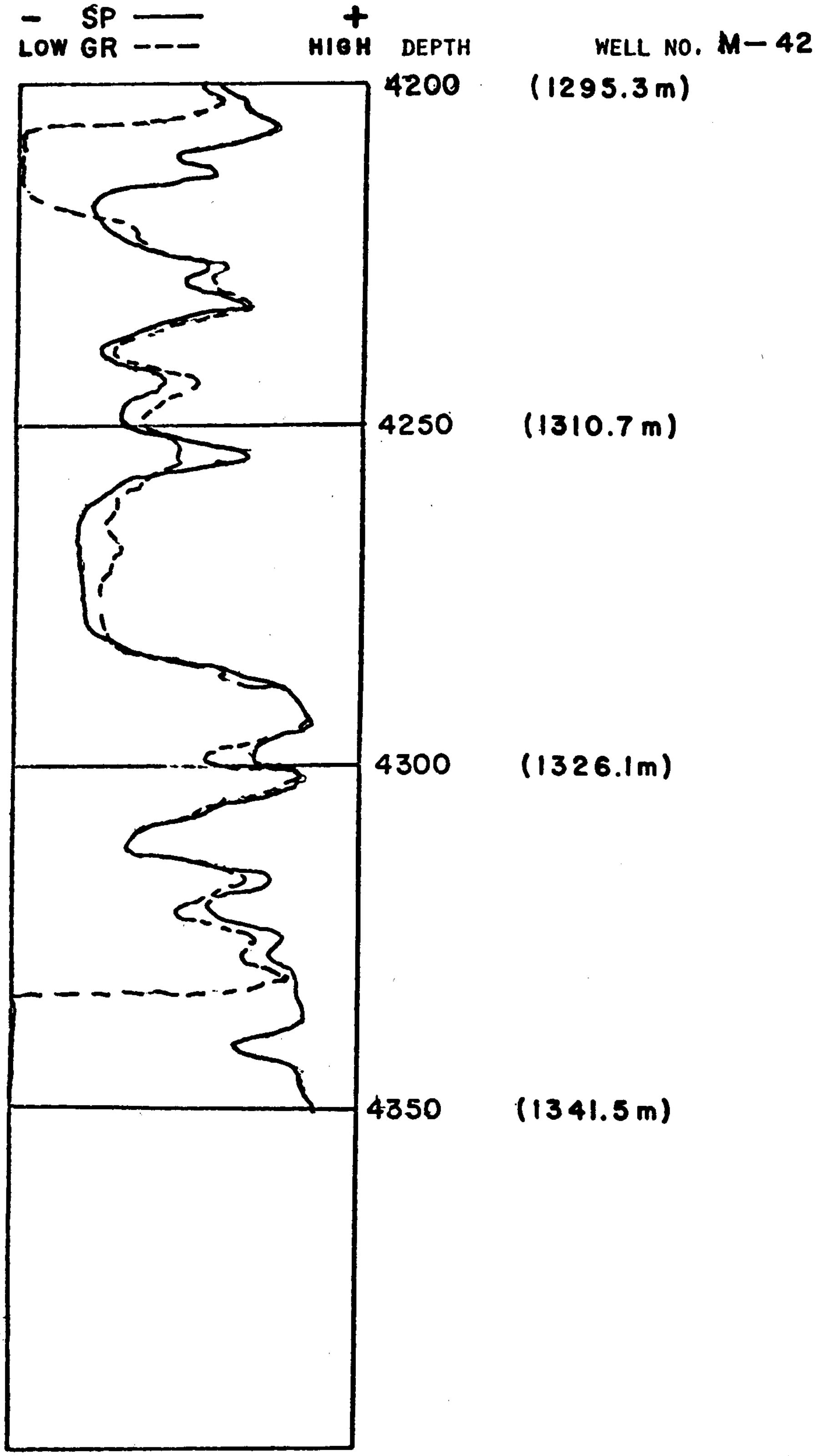

Fig. D-25. SP-Gamma Ray Overlay.

COMPUTED RESULTS WELL 42

WELL NUMBER = 42
FIELD : CERRO PRIETO
RANGE : FROM 2674 TO 2708 TABLE 42-1'
COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.07
PHINC= 0.36
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 165.0
RSH= 1.00

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
2674	-63.	44.	0.25	0.33	0.9	0.28	0.23	0.28	0.471	0.05	70044.	0.06	55108.	0.04	79704.	0.94	0.11	2.33
2676	-67.	53.	0.29	0.32	0.8	0.10	0.28	0.30	1.000	0.05	72617.	0.08	33422.	0.05	68326.	0.94	0.07	2.88
2678	-67.	42.	0.28	0.32	0.7	0.14	0.27	0.30	0.353	0.05	72617.	0.08	40848.	0.04	84114.	1.01	0.08	2.85
2680	-65.	43.	0.30	0.35	0.7	0.17	0.29	0.32	0.412	0.05	71348.	0.08	38827.	0.05	67212.	0.92	0.07	2.69
2682	-64.	43.	0.34	0.35	0.7	0.03	0.34	0.34	0.412	0.05	70700.	0.08	37713.	0.06	52817.	0.87	0.07	2.61
2684	-62.	41.	0.34	0.39	0.7	0.17	0.33	0.36	0.294	0.05	68987.	0.09	34629.	0.07	45322.	0.79	0.07	2.47
2686	-61.	40.	0.32	0.40	0.7	0.28	0.30	0.35	0.235	0.05	68320.	0.08	36989.	0.06	54206.	0.82	0.07	2.36
2688	-60.	44.	0.35	0.38	0.7	0.10	0.34	0.36	0.471	0.05	67645.	0.08	38988.	0.07	44106.	0.80	0.08	2.26
2690	-62.	43.	0.31	0.32	0.9	0.03	0.31	0.31	0.412	0.05	68987.	0.07	41484.	0.06	54027.	0.89	0.08	2.39
2692	-61.	40.	0.28	0.31	1.0	0.10	0.27	0.29	0.235	0.05	68320.	0.08	41305.	0.06	58547.	0.90	0.08	2.31
2694	-62.	44.	0.28	0.29	1.1	0.03	0.28	0.28	0.471	0.05	68987.	0.07	45525.	0.06	53932.	0.89	0.09	2.35
2696	-62.	45.	0.23	0.27	1.0	0.14	0.22	0.25	0.529	0.05	68600.	0.06	55000.	0.04	88674.	1.05	0.11	2.23
2698	-63.	44.	0.25	0.30	1.2	0.17	0.24	0.27	0.471	0.05	69253.	0.07	44733.	0.05	59167.	0.87	0.09	2.43
2700	-64.	39.	0.22	0.28	1.3	0.21	0.21	0.24	0.176	0.05	69897.	0.05	60718.	0.05	68256.	0.89	0.12	2.34
2702	-64.	36.	0.22	0.28	1.2	0.21	0.21	0.24	0.000	0.05	69897.	0.05	65603.	0.04	82272.	0.97	0.13	2.28
2704	-65.	39.	0.25	0.28	1.0	0.10	0.24	0.26	0.176	0.05	70532.	0.06	48376.	0.05	72489.	0.97	0.09	2.56
2706	-64.	43.	0.26	0.26	1.2	0.00	0.26	0.26	0.412	0.05	69897.	0.06	56574.	0.05	59320.	0.93	0.11	2.38
2708	-60.	44.	0.23	0.25	1.2	0.07	0.23	0.24	0.471	0.05	66901.	0.04	95377.	0.04	77755.	1.03	0.23	1.60

WELL NUMBER = 42
FIELD : CERRO PRIETO
RANGE : FROM 2674 TO 2708

TABLE 42-2'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.07
PHINC= 0.36
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 400.0
RSH= 1.00

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
2674	-63.	44.	0.25	0.33	0.9	0.28	0.23	0.28	0.471	0.04	29217.	0.02	55108.	0.04	30537.	0.90	0.14	1.14
2676	-67.	53.	0.29	0.32	0.8	0.10	0.28	0.30	1.000	0.04	29772.	0.03	38422.	0.05	25872.	0.90	0.08	1.50
2678	-67.	42.	0.28	0.32	0.7	0.14	0.27	0.29	0.353	0.04	29772.	0.03	40848.	0.04	31750.	0.98	0.09	1.47
2680	-65.	43.	0.30	0.35	0.7	0.17	0.29	0.32	0.412	0.04	29498.	0.03	38827.	0.05	25589.	0.83	0.08	1.42
2682	-64.	43.	0.34	0.35	0.7	0.03	0.34	0.34	0.412	0.04	29358.	0.03	37713.	0.06	20030.	0.83	0.08	1.39
2684	-62.	41.	0.34	0.39	0.7	0.17	0.33	0.36	0.294	0.04	29074.	0.04	34629.	0.07	17553.	0.75	0.07	1.35
2686	-61.	40.	0.32	0.40	0.7	0.28	0.30	0.35	0.235	0.04	28929.	0.03	36989.	0.06	21057.	0.78	0.08	1.29
2688	-60.	44.	0.35	0.38	0.7	0.10	0.34	0.36	0.471	0.04	28782.	0.03	38988.	0.07	17004.	0.76	0.09	1.23
2690	-62.	43.	0.31	0.32	0.9	0.03	0.31	0.31	0.412	0.04	29074.	0.03	41434.	0.06	20613.	0.85	0.09	1.27
2692	-61.	40.	0.28	0.31	1.0	0.10	0.27	0.29	0.235	0.04	28929.	0.03	41305.	0.05	22421.	0.86	0.09	1.23
2694	-62.	44.	0.28	0.29	1.1	0.03	0.28	0.28	0.471	0.04	29074.	0.03	45525.	0.06	20583.	0.84	0.10	1.22
2696	-62.	45.	0.23	0.27	1.0	0.14	0.22	0.24	0.529	0.04	29074.	0.02	55000.	0.04	33931.	1.00	0.14	1.10
2698	-63.	44.	0.25	0.30	1.2	0.17	0.24	0.27	0.471	0.04	29217.	0.03	44733.	0.05	22968.	0.83	0.10	1.27
2700	-64.	39.	0.22	0.28	1.3	0.21	0.21	0.24	0.176	0.04	29358.	0.02	60718.	0.05	26528.	0.86	0.15	1.11
2702	-64.	36.	0.22	0.28	1.2	0.21	0.21	0.24	0.000	0.04	29358.	0.02	65603.	0.04	31783.	0.93	0.18	1.04
2704	-65.	39.	0.25	0.28	1.0	0.10	0.24	0.26	0.176	0.04	29498.	0.03	48376.	0.05	27792.	0.93	0.11	1.30
2706	-64.	43.	0.26	0.26	1.2	0.00	0.26	0.26	0.412	0.04	29358.	0.02	56574.	0.05	22660.	0.89	0.14	1.16
2708	-60.	44.	0.23	0.25	1.2	0.07	0.23	0.24	0.471	0.04	28782.	0.02	95377.	0.04	29867.	0.98	99.00	99.00

WELL NUMBER = 42
FIELD : CERRO PRIETO
RANGE : FROM 2674 TO 2708

TABLE 42-3'

TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300

Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.07
PHINC= 0.36
AN= 1.00
AM= 2.40
RWCLY= 0.10
TDEEP= 400.0
RSH= 1.00

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
2674	-63.	44.	0.25	0.33	0.9	0.28	0.23	0.28	0.471	0.04	29217.	0.02	55108.	0.04	35655.	0.96	0.14	1.14
2676	-67.	53.	0.29	0.32	0.8	0.10	0.28	0.30	1.000	0.04	29772.	0.03	38422.	0.04	29700.	0.96	0.08	1.50
2678	-67.	42.	0.28	0.32	0.7	0.14	0.27	0.29	0.353	0.04	29772.	0.03	40848.	0.04	36592.	1.04	0.09	1.47
2680	-65.	43.	0.30	0.35	0.7	0.17	0.29	0.32	0.412	0.04	29498.	0.03	38827.	0.04	29257.	0.93	0.08	1.42
2682	-64.	43.	0.34	0.35	0.7	0.03	0.34	0.34	0.412	0.04	29358.	0.03	37713.	0.05	22572.	0.88	0.08	1.39
2684	-62.	41.	0.34	0.39	0.7	0.17	0.33	0.36	0.294	0.04	29074.	0.04	34629.	0.06	19791.	0.79	0.07	1.35
2686	-61.	40.	0.32	0.40	0.7	0.28	0.30	0.35	0.235	0.04	28929.	0.03	36989.	0.05	23911.	0.83	0.08	1.29
2688	-60.	44.	0.35	0.38	0.7	0.10	0.34	0.36	0.471	0.04	28782.	0.03	39988.	0.06	19101.	0.80	0.09	1.23
2690	-62.	43.	0.31	0.32	0.9	0.03	0.31	0.31	0.412	0.04	29074.	0.03	41484.	0.05	23473.	0.90	0.09	1.27
2692	-61.	40.	0.28	0.31	1.0	0.10	0.27	0.29	0.235	0.04	28929.	0.03	41305.	0.05	25841.	0.91	0.09	1.23
2694	-62.	44.	0.28	0.29	1.1	0.03	0.28	0.28	0.471	0.04	29074.	0.03	45525.	0.05	23709.	0.90	0.10	1.22
2696	-62.	45.	0.23	0.27	1.0	0.14	0.22	0.24	0.529	0.04	29074.	0.02	55000.	0.03	40005.	1.08	0.14	1.10
2698	-63.	44.	0.25	0.30	1.2	0.17	0.24	0.27	0.471	0.04	29217.	0.03	44733.	0.05	26840.	0.89	0.10	1.27
2700	-64.	39.	0.22	0.28	1.3	0.21	0.21	0.24	0.176	0.04	29358.	0.02	60718.	0.04	31473.	0.92	0.15	1.11
2702	-64.	36.	0.22	0.28	1.2	0.21	0.21	0.24	0.000	0.04	29358.	0.02	65603.	0.03	37673.	1.00	0.18	1.04
2704	-65.	39.	0.25	0.28	1.0	0.10	0.24	0.26	0.176	0.04	29498.	0.03	48376.	0.04	32453.	1.00	0.11	1.30
2706	-64.	43.	0.26	0.26	1.2	0.00	0.26	0.26	0.412	0.04	29358.	0.02	56574.	0.05	26321.	0.95	0.14	1.16
2708	-60.	44.	0.23	0.25	1.2	0.07	0.23	0.24	0.471	0.04	28782.	0.02	95377.	0.04	35215.	1.06	99.00	99.00

WELL NUMBER = 42
FIELD : CERRO PRIETO
RANGE : FROM 3042 TO 3080 AABLE 42-4′
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.07
PHINC= 0.36
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 400.0
RSH= 1.00

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3042	-51.	68.	0.19	0.23	1.5	0.14	0.18	0.20	1.000	0.05	27383.	0.03	48856.	0.03	37197.	1.05	0.14	0.80
3044	-61.	64.	0.19	0.24	1.1	0.17	0.18	0.21	0.833	0.04	28929.	0.03	47061.	0.03	52393.	1.18	0.11	1.16
3046	-64.	56.	0.23	0.26	0.8	0.10	0.22	0.24	0.500	0.04	29358.	0.03	52023.	0.03	46935.	1.18	0.12	1.22
3048	-63.	57.	0.24	0.25	0.7	0.03	0.24	0.24	0.542	0.04	29217.	0.03	45168.	0.03	49590.	1.25	0.10	1.26
3050	-59.	60.	0.24	0.25	0.9	0.03	0.24	0.24	0.667	0.04	28634.	0.02	74039.	0.03	39139.	1.13	0.26	0.70
3052	-58.	59.	0.24	0.24	0.8	0.00	0.24	0.24	0.625	0.04	28484.	0.02	79216.	0.03	41291.	1.18	0.37	0.52
3054	-57.	55.	0.23	0.22	0.7	0.00	0.23	0.23	0.458	0.04	28332.	0.03	37668.	0.03	53599.	1.33	0.09	1.14
3056	-52.	52.	0.23	0.23	1.1	0.00	0.23	0.23	0.333	0.05	27546.	0.02	60124.	0.04	35353.	1.12	0.20	0.66
3058	-53.	63.	0.23	0.23	1.3	0.00	0.23	0.23	0.792	0.05	27706.	0.03	44557.	0.04	28413.	1.01	0.11	0.92
3060	-55.	68.	0.20	0.24	1.3	0.14	0.19	0.21	1.000	0.04	28023.	0.03	39275.	0.04	36223.	1.03	0.09	1.05
3062	-55.	56.	0.24	0.24	1.2	0.00	0.24	0.24	0.500	0.04	28023.	0.03	53825.	0.04	28531.	1.01	0.15	0.86
3064	-60.	67.	0.21	0.24	0.9	0.10	0.20	0.22	0.958	0.04	28782.	0.04	34296.	0.03	52766.	1.25	0.07	1.28
3066	-61.	59.	0.23	0.24	0.7	0.03	0.23	0.23	0.625	0.04	28929.	0.03	39212.	0.02	59040.	1.35	0.09	1.26
3068	-65.	60.	0.24	0.24	1.0	0.00	0.24	0.24	0.667	0.04	29498.	0.02	60976.	0.04	34282.	1.07	0.15	1.15
3070	-65.	53.	0.24	0.22	0.9	0.00	0.24	0.24	0.375	0.04	29498.	0.05	24524.	0.04	36553.	1.10	0.05	1.59
3072	-63.	44.	0.27	0.24	0.7	0.00	0.28	0.28	0.000	0.04	29217.	0.04	33360.	0.04	33209.	1.06	0.07	1.41
3074	-62.	48.	0.27	0.26	0.8	0.00	0.27	0.27	0.167	0.04	29074.	0.04	33707.	0.04	30002.	1.01	0.07	1.36
3076	-61.	49.	0.27	0.27	0.8	0.00	0.27	0.27	0.208	0.04	28929.	0.04	33904.	0.04	31991.	1.05	0.07	1.32
3078	-59.	52.	0.29	0.29	1.0	0.00	0.29	0.29	0.333	0.04	28634.	0.04	33123.	0.06	21586.	0.88	0.07	1.26
3080	-56.	52.	0.26	0.26	1.0	0.00	0.26	0.26	0.333	0.04	28178.	0.03	43124.	0.04	28923.	1.01	0.10	1.04

WELL NUMBER = 42
FIELD : CERRO PRIETO
RANGE : FROM 3042 TO 3080

TABLE 42-5'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.07
PHINC= 0.36
AN= 1.00
AM= 2.40
RWCLY= 0.10
TDEEP= 400.0
RSH= 1.00

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3042	-51.	68.	0.19	0.23	1.5	0.14	0.18	0.20	1.000	0.05	27383.	0.03	48856.	0.03	44841.	1.13	0.14	0.80
3044	-61.	64.	0.19	0.24	1.1	0.17	0.18	0.21	0.833	0.04	28929.	0.03	47061.	0.02	63116.	1.27	0.11	1.16
3046	-64.	56.	0.23	0.26	0.8	0.10	0.22	0.24	0.500	0.04	29358.	0.03	52023.	0.02	55366.	1.27	0.12	1.22
3048	-63.	57.	0.24	0.25	0.7	0.03	0.24	0.24	0.542	0.04	29217.	0.03	45168.	0.02	58290.	1.34	0.10	1.26
3050	-59.	60.	0.24	0.25	0.9	0.03	0.24	0.24	0.667	0.04	28634.	0.02	74039.	0.03	45968.	1.22	0.26	0.70
3052	-58.	59.	0.24	0.24	0.8	0.00	0.24	0.24	0.625	0.04	28484.	0.02	79216.	0.03	48526.	1.27	0.37	0.52
3054	-57.	55.	0.23	0.22	0.7	0.00	0.23	0.23	0.458	0.04	28332.	0.03	37668.	0.02	63299.	1.43	0.09	1.14
3056	-52.	52.	0.23	0.23	1.1	0.00	0.23	0.23	0.333	0.05	27546.	0.02	60124.	0.03	41719.	1.20	0.20	0.66
3058	-53.	63.	0.23	0.23	1.3	0.00	0.23	0.23	0.792	0.05	27706.	0.03	44557.	0.04	33493.	1.09	0.11	0.92
3060	-55.	68.	0.20	0.24	1.3	0.14	0.19	0.21	1.000	0.04	28023.	0.03	39275.	0.03	43407.	1.11	0.09	1.05
3062	-55.	56.	0.24	0.24	1.2	0.00	0.24	0.24	0.500	0.04	28023.	0.03	53825.	0.04	33474.	1.08	0.15	0.86
3064	-60.	67.	0.21	0.24	0.9	0.10	0.20	0.22	0.958	0.04	28782.	0.04	34296.	0.02	62909.	1.34	0.07	1.28
3066	-61.	59.	0.23	0.24	0.7	0.03	0.23	0.23	0.625	0.04	28929.	0.03	39212.	0.02	69783.	1.46	0.09	1.26
3068	-65.	60.	0.24	0.24	1.0	0.00	0.24	0.24	0.667	0.04	29498.	0.02	60976.	0.03	40254.	1.15	0.15	1.15
3070	-65.	53.	0.24	0.22	0.9	0.00	0.24	0.24	0.375	0.04	29498.	0.05	24524.	0.03	42838.	1.18	0.05	1.59
3072	-63.	44.	0.27	0.24	0.7	0.00	0.28	0.28	0.000	0.04	29217.	0.04	33360.	0.03	38361.	1.13	0.07	1.41
3074	-62.	48.	0.27	0.26	0.8	0.00	0.27	0.27	0.167	0.04	29074.	0.04	33707.	0.04	34710.	1.08	0.07	1.36
3076	-61.	49.	0.27	0.27	0.8	0,00	0.27	0.27	0.208	0.04	28929.	0.04	33904.	0.03	37058.	1.12	0.07	1.32
3078	-59.	52.	0.29	0.29	1.0	0.00	0.29	0.29	0.333	0.04	28634.	0.04	33123.	0.05	24765.	0.94	0.07	1.26
3080	-56.	52.	0.26	0.26	1.0	0.00	0.26	0.26	0.333	0.04	28178.	0.03	43124.	0.04	33632.	1.08	0.10	1.04

WELL NUMBER = 42
FIELD : CERRO PRIETO
RANGE : FROM 3042 TO 3080

TABLE 42-6′
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.07
PHINC= 0.36
AN= 1.00
AM= 2.50
RWCLY= 0.10
TDEEP= 400.0
RSH= 1.00

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3042	-51.	68.	0.19	0.23	1.5	0.14	0.18	0.20	1.000	0.05	27383.	0.03	48856.	0.03	54047.	1.22	0.14	0.80
3044	-61.	64.	0.19	0.24	1.1	0.17	0.18	0.21	0.833	0.04	28929.	0.03	47061.	0.02	76027.	1.37	0.11	1.16
3046	-64.	56.	0.23	0.26	0.8	0.10	0.22	0.24	0.500	0.04	29358.	0.03	52023.	0.02	65331.	1.36	0.12	1.22
3048	-63.	57.	0.24	0.25	0.7	0.03	0.24	0.24	0.542	0.04	29217.	0.03	45168.	0.02	68559.	1.44	0.10	1.26
3050	-59.	60.	0.24	0.25	0.9	0.03	0.24	0.24	0.667	0.04	28634.	0.02	74039.	0.03	54018.	1.30	0.26	0.70
3052	-58.	59.	0.24	0.24	0.8	0.00	0.24	0.24	0.625	0.04	28484.	0.02	79216.	0.02	57072.	1.36	0.37	0.52
3054	-57.	55.	0.23	0.22	0.7	0.00	0.23	0.23	0.458	0.04	28332.	0.03	37668.	0.02	74812.	1.54	0.09	1.14
3056	-52.	52.	0.23	0.23	1.1	0.00	0.23	0.23	0.333	0.05	27546.	0.02	60124.	0.03	49269.	1.29	0.20	0.66
3058	-53.	63.	0.23	0.23	1.3	0.00	0.23	0.23	0.792	0.05	27706.	0.03	44557.	0.03	39513.	1.17	0.11	0.92
3060	-55.	68.	0.20	0.24	1.3	0.14	0.19	0.21	1.000	0.04	28023.	0.03	39275.	0.03	52008.	1.20	0.09	1.05
3062	-55.	56.	0.24	0.24	1.2	0.00	0.24	0.24	0.500	0.04	28023.	0.03	53825.	0.03	39301.	1.16	0.15	0.86
3064	-60.	67.	0.21	0.24	0.9	0.10	0.20	0.22	0.958	0.04	28782.	0.04	34296.	0.02	75027.	1.45	0.07	1.28
3066	-61.	59.	0.23	0.24	0.7	0.03	0.23	0.23	0.625	0.04	28929.	0.03	39212.	0.02	82534.	1.56	0.09	1.26
3068	-65.	60.	0.24	0.24	1.0	0.00	0.24	0.24	0.667	0.04	29498.	0.02	60976.	0.03	47303.	1.23	0.15	1.15
3070	-65.	53.	0.24	0.22	0.9	0.00	0.24	0.24	0.375	0.04	29498.	0.05	24524.	0.03	50239.	1.27	0.05	1.59
3072	-63.	44.	0.27	0.24	0.7	0.00	0.28	0.28	0.000	0.04	29217.	0.04	33360.	0.03	44338.	1.20	0.07	1.41
3074	-62.	48.	0.27	0.26	0.8	0.00	0.27	0.27	0.167	0.04	29074.	0.04	33707.	0.03	40181.	1.16	0.07	1.36
3076	-61.	49.	0.27	0.27	0.8	0.00	0.27	0.27	0.208	0.04	28929.	0.04	33904.	0.03	42954.	1.19	0.07	1.32
3078	-59.	52.	0.29	0.29	1.0	0.00	0.29	0.29	0.333	0.04	28634.	0.04	33123.	0.04	28428.	1.00	0.07	1.26
3080	-56.	52.	0.26	0.26	1.0	0.00	0.26	0.26	0.333	0.04	28178.	0.03	43124.	0.03	39133.	1.16	0.10	1.04

WELL NUMBER = 42
FIELD : CERRO PRIETO
RANGE : FROM 3042 TO 3080

TABLE 42-7'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.07
PHINC= 0.36
AN= 1.00
AM= 2.00
RWCLY= 0.10
TDEEP= 400.0
RSH= 1.00

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3042	-51.	68.	0.19	0.23	1.5	0.14	0.18	0.20	1.000	0.05	27383.	0.03	48856.	0.06	21165.	0.83	0.14	0.80
3044	-61.	64.	0.19	0.24	1.1	0.17	0.18	0.21	0.833	0.04	28929.	0.03	47061.	0.04	29891.	0.94	0.11	1.16
3046	-64.	56.	0.23	0.26	0.8	0.10	0.22	0.24	0.500	0.04	29358.	0.03	52023.	0.04	28625.	0.95	0.12	1.22
3048	-63.	57.	0.24	0.25	0.7	0.03	0.24	0.24	0.542	0.04	29217.	0.03	45168.	0.04	30637.	1.01	0.10	1.26
3050	-59.	60.	0.24	0.25	0.9	0.03	0.24	0.24	0.667	0.04	28634.	0.02	74039.	0.05	24237.	0.92	0.26	0.70
3052	-58.	59.	0.24	0.24	0.8	0.00	0.24	0.24	0.625	0.04	28484.	0.02	79216.	0.05	25551.	0.95	0.37	0.52
3054	-57.	55.	0.23	0.22	0.7	0.00	0.23	0.23	0.458	0.04	28332.	0.03	37668.	0.04	32694.	1.07	0.09	1.14
3056	-52.	52.	0.23	0.23	1.1	0.00	0.23	0.23	0.333	0.05	27546.	0.02	60124.	0.06	21616.	0.90	0.20	0.66
3058	-53.	63.	0.23	0.23	1.3	0.00	0.23	0.23	0.792	0.05	27706.	0.03	44557.	0.07	17427.	0.81	0.11	0.92
3060	-55.	68.	0.20	0.24	1.3	0.14	0.19	0.21	1.000	0.04	28023.	0.03	39275.	0.06	20994.	0.83	0.09	1.05
3062	-55.	56.	0.24	0.24	1.2	0.00	0.24	0.24	0.500	0.04	28023.	0.03	53825.	0.07	17746.	0.81	0.15	0.86
3064	-60.	67.	0.21	0.24	0.9	0.10	0.20	0.22	0.958	0.04	28782.	0.04	34296.	0.04	31176.	0.99	0.07	1.28
3066	-61.	59.	0.23	0.24	0.7	0.03	0.23	0.23	0.625	0.04	28929.	0.03	39212.	0.04	35888.	1.09	0.09	1.26
3068	-65.	60.	0.24	0.24	1.0	0.00	0.24	0.24	0.667	0.04	29498.	0.02	60976.	0.06	21269.	0.86	0.15	1.15
3070	-65.	53.	0.24	0.22	0.9	0.00	0.24	0.24	0.375	0.04	29498.	0.05	24524.	0.05	22808.	0.89	0.05	1.59
3072	-63.	44.	0.27	0.24	0.7	0.00	0.28	0.28	0.000	0.04	29217.	0.04	33360.	0.06	21624.	0.87	0.07	1.41
3074	-62.	48.	0.27	0.26	0.8	0.00	0.27	0.27	0.167	0.04	29074.	0.04	33707.	0.06	19447.	0.83	0.07	1.36
3076	-61.	49.	0.27	0.27	0.8	0.00	0.27	0.27	0.208	0.04	28929.	0.04	33904.	0.06	20658.	0.86	0.07	1.32
3078	-59.	52.	0.29	0.29	1.0	0.00	0.29	0.29	0.333	0.04	28634.	0.04	33123.	0.08	14342.	0.73	0.07	1.26
3080	-56.	52.	0.26	0.26	1.0	0.00	0.26	0.26	0.333	0.04	28178.	0.03	43124.	0.07	18469.	0.83	0.10	1.04

WELL NUMBER = 42
FIELD : CERRO PRIETO
RANGE : FROM 3814 TO 3840 TABLE 42-8'
COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.07
PHINC= 0.36
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 260.0
RSH= 2.00

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3814	-60.	72.	0.23	0.19	2.0	0.00	0.24	0.24	0.875	0.05	43989.	0.04	45573.	0.07	25449.	0.78	0.10	1.63
3816	-63.	75.	0.25	0.19	1.8	0.00	0.26	0.26	1.000	0.04	44925.	0.04	47034.	0.08	22666.	0.74	0.10	1.78
3818	-64.	66.	0.23	0.20	1.8	0.00	0.24	0.24	0.625	0.04	45229.	0.04	56054.	0.06	29665.	0.83	0.12	1.73
3820	-64.	59.	0.23	0.18	1.6	0.00	0.24	0.24	0.333	0.04	45229.	0.03	60298.	0.06	31413.	0.85	0.13	1.68
3822	-64.	54.	0.20	0.16	1.8	0.00	0.21	0.21	0.125	0.04	45229.	0.04	55834.	0.05	39843.	0.95	0.12	1.73
3824	-64.	60.	0.22	0.16	1.9	0.00	0.23	0.23	0.375	0.04	45057.	0.04	52634.	0.07	28349.	0.81	0.11	1.77
3826	-64.	62.	0.22	0.18	1.7	0.00	0.23	0.23	0.458	0.04	45057.	0.04	51994.	0.06	32958.	0.87	0.11	1.77
3828	-65.	59.	0.22	0.19	1.8	0.00	0.23	0.23	0.333	0.04	45354.	0.04	45809.	0.06	31969.	0.86	0.09	1.91
3830	-64.	59.	0.24	0.20	1.7	0.00	0.25	0.25	0.333	0.04	45057.	0.04	52165.	0.07	26419.	0.79	0.11	1.77
3832	-64.	57.	0.23	0.20	1.7	0.00	0.24	0.24	0.250	0.04	45057.	0.04	56159.	0.06	31891.	0.86	0.12	1.73
3834	-65.	52.	0.26	0.19	1.6	0.00	0.28	0.28	0.042	0.04	45354.	0.03	63808.	0.08	22769.	0.74	0.14	1.70
3836	-65.	51.	0.26	0.19	1.5	0.00	0.28	0.28	0.000	0.04	45182.	0.04	54352.	0.08	23494.	0.75	0.11	1.80
3838	-64.	57.	0.25	0.19	1.5	0.00	0.26	0.26	0.250	0.04	44886.	0.04	56395.	0.07	26093.	0.79	0.12	1.72
3840	-54.	72.	0.23	0.19	1.9	0.00	0.24	0.24	0.875	0.05	41711.	0.05	43479.	0.07	25903.	0.81	0.10	1.34

WELL NUMBER = 42
FIELD : CERRO PRIETO
RANGE : FROM 3814 TO 3840

TABLE 42-9'
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.300
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.07
FHINC= 0.36
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 400.0
RSH= 2.00

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3814	-60.	72.	0.23	0.19	2.0	0.00	0.24	0.24	0.875	0.04	26732.	0.03	45573.	0.07	15969.	0.77	0.11	1.15
3816	-63.	75.	0.25	0.19	1.8	0.00	0.26	0.26	1.000	0.04	29217.	0.03	47034.	0.08	14246.	0.72	0.11	1.24
3818	-64.	66.	0.23	0.20	1.8	0.00	0.24	0.24	0.625	0.04	29358.	0.02	56054.	0.06	18576.	0.81	0.14	1.17
3820	-64.	59.	0.23	0.18	1.6	0.00	0.24	0.24	0.333	0.04	29358.	0.02	60298.	0.06	19654.	0.83	0.15	1.11
3822	-64.	54.	0.20	0.16	1.8	0.00	0.21	0.21	0.125	0.04	29358.	0.02	55834.	0.05	24848.	0.93	0.14	1.17
3824	-64.	60.	0.22	0.16	1.9	0.00	0.23	0.23	0.375	0.04	29358.	0.03	52634.	0.07	17836.	0.80	0.13	1.21
3826	-64.	62.	0.22	0.18	1.7	0.00	0.23	0.23	0.458	0.04	29358.	0.03	51994.	0.06	20693.	0.85	0.12	1.22
3828	-65.	59.	0.22	0.19	1.8	0.00	0.23	0.23	0.333	0.04	29498.	0.03	45809.	0.06	20081.	0.84	0.10	1.33
3830	-64.	59.	0.24	0.20	1.7	0.00	0.25	0.25	0.333	0.04	29358.	0.03	52165.	0.07	16637.	0.77	0.12	1.22
3832	-64.	57.	0.23	0.20	1.7	0.00	0.24	0.24	0.250	0.04	29358.	0.02	56159.	0.06	20032.	0.84	0.14	1.17
3834	-65.	52.	0.26	0.19	1.6	0.00	0.28	0.28	0.042	0.04	29498.	0.02	63808.	0.08	14368.	0.72	0.16	1.11
3836	-65.	51.	0.26	0.19	1.5	0.00	0.28	0.28	0.000	0.04	29498.	0.02	54352.	0.08	14880.	0.73	0.13	1.23
3838	-64.	57.	0.25	0.19	1.5	0.00	0.26	0.26	0.250	0.04	29358.	0.02	56395.	0.07	16503.	0.77	0.14	1.16
3840	-54.	72.	0.23	0.19	1.9	0.00	0.24	0.24	0.875	0.05	27865.	0.03	43479.	0.07	16334.	0.79	0.11	0.97

WELL NUMBER = 42
FIELD : CERRO PRIETO
RANGE : FROM 3814 TO 3840

TABLE 42-10′
TDEEP IS USED

COMPUTED DATA IS AS BELOW: Rmf= 0.500
Tmf= 75.000
RHOmf= 1.100
PHIDC= 0.07
PHINC= 0.36
AN= 1.00
AM= 2.30
RWCLY= 0.10
TDEEP= 400.0
RSH= 2.00

DEPTH	SP	GR	PHId	PHIn	Rt	VSH	PHIE	PHITD	VSHGR	RWSP	PPMSP	RWAX	PPMAX	RWAD	PPMD	SW	RMF	
3814	-60.	72.	0.23	0.19	2.0	0.00	0.24	0.24	0.875	0.05	24533.	0.05	25683.	0.07	15969.	0.82	0.11	1.15
3816	-63.	75.	0.25	0.19	1.8	0.00	0.26	0.26	1.000	0.05	25096.	0.05	26492.	0.08	14246.	0.77	0.11	1.24
3818	-64.	66.	0.23	0.20	1.8	0.00	0.24	0.24	0.625	0.05	25280.	0.04	31482.	0.06	18576.	0.87	0.14	1.17
3820	-64.	59.	0.23	0.18	1.6	0.00	0.24	0.24	0.333	0.05	25280.	0.04	33825.	0.06	19654.	0.89	0.15	1.11
3822	-64.	54.	0.20	0.16	1.8	0.00	0.21	0.21	0.125	0.05	25280.	0.04	31361.	0.05	24848.	0.99	0.14	1.17
3824	-64.	60.	0.22	0.16	1.9	0.00	0.23	0.23	0.375	0.05	25280.	0.04	29591.	0.07	17836.	0.85	0.13	1.21
3826	-64.	62.	0.22	0.18	1.7	0.00	0.23	0.23	0.458	0.05	25280.	0.04	29238.	0.06	20693.	0.91	0.12	1.22
3828	-65.	59.	0.22	0.19	1.8	0.00	0.23	0.23	0.333	0.05	25463.	0.05	25813.	0.06	20081.	0.90	0.10	1.33
3830	-64.	59.	0.24	0.20	1.7	0.00	0.25	0.25	0.333	0.05	25280.	0.04	29333.	0.07	16637.	0.83	0.12	1.22
3832	-64.	57.	0.23	0.20	1.7	0.00	0.24	0.24	0.250	0.05	25280.	0.04	31540.	0.06	20032.	0.90	0.14	1.17
3834	-65.	52.	0.26	0.19	1.6	0.00	0.28	0.28	0.042	0.05	25463.	0.04	35761.	0.08	14368.	0.77	0.16	1.11
3836	-65.	51.	0.26	0.19	1.5	0.00	0.28	0.28	0.000	0.05	25463.	0.04	30542.	0.08	14880.	0.78	0.13	1.23
3838	-64.	57.	0.25	0.19	1.5	0.00	0.26	0.26	0.250	0.05	25280.	0.04	31670.	0.07	16503.	0.82	0.14	1.16
3840	-54.	72.	0.23	0.19	1.9	0.00	0.24	0.24	0.875	0.05	23368.	0.05	24521.	0.07	16384.	0.85	0.11	0.97

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